ECONOMIC POTETIALTIES OF THE DEVELOPMENT
OF FODDER CROPS IN BUNDELKHAND

Thesis Submitted for the degree of

Doctor of Philosphy

IN

ECONMICS

OF

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BY

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I N D E X

C H A P T E R I

GEOGRAPHICAL SURVEY OF BUNDELKHAND.

1. PHYSICAL ENVIRONMENT:

The Bundelkhand region of Uttar Pradesh forms the northern most part of Jhansi, Lalitpur, Hamirpur, Jalaun and Banda. The region is bounded by the Yamuna river in the north and by the State of Madhya Pradesh on all the other sides.

The total area of the region is 29.95 lakh hectares. The district-wise breakup of the area is as follows:[1]

Lalitpur	5.04 lakh hectares
Jhansi	5.11 lakh hectares
Jalaun	4.16 lakh hectares
Hamirpur	7.28 lakh hectares
Banda	7.90 lakh hectares

GENERAL FEATURES: General features have a dominating influence on weather and vegetation and on the economic activities. Their examination is valuable for the study of the economic reorganisation of Bundelkhand.

Bundelkhand region lies to the south of Yamuna to massive block of territory of Uttar Pradesh. The total area covered is 11640 square miles equivalent to 74.5 lakh acres which is about one-eighth of the total area but the population is comparatively sparse, being about 3 millions or less than 5%. The history and geography, the geology and the minerology, the fauna and the flora, the rivers and the soils, the high lands and the low lands, the people and their customs, the agriculture and the irrigation, the industries and the raw produce, the degree of the prosperity and the economic structure are all somewhat distinct in character as compared with the similar features of other parts of the Pradesh. [2]

It is rightly said that this area forms a slice of the extensive system of the Archaeen crystalline rocks which occupy wide area in Orissa, Madhya Pradesh and Chhota Nagpur and that the present shape has occured after a long process of thermal and regional metamorphism. This region is believed to represent in part atleast the first formed crust of the earth, the consolidation of the gaseous and molten matter.

Bundelkhand territory rises gradually from the South of the Gangetic plains and culminates in the high lands of

Central India. The northern edge of this part of the country is formed by the Yamuna river and the southern edge a steep line of prominent escarpments which constitute the Vindhyan mountains. The people of this extensive tract have common qualification and common economical structure. Since the economic life of a people is bound with the physical features of the area in which they reside, a description of the general topography and landscape shall be of great value in the study of the subject.

PHYSICAL ENVIRONMENT OF JHANSI: On the extreme south of the Vindhyan plateau ending in an abrupt escarpment from whose base a rolling black soil plain cut up into sections by innumerable small streams stretches northward, thence on uneven red soil tract dotted with numerous bare or scrub clad rocky hills continues upto Jhansi and Mau towns. This is succeeded again by level black soil, in which the rocky outcrops lessen and finally disappear. The chief rivers are the Betwa, the Dhasan and the Pahuj and are fringed by wide belt of broken ground which expands in the north to a sea of ravines growing little grass and thorny shrubs.

Till February, 1974 district Jhansi was the second biggest district of Uttar Pradesh. But, in March 1974 it was

divided into two parts; the one was district Jhansi and the other was district Lalitpur.'[3]

PHYSICAL ENVIRONMENT OF HAMIRPUR: "The landscape is similar to that of Jhansi and the southern part contains numerous outscapes of gniss rock, clustering into low ranges. At the base of the hills lie the villages which they have helped partly to form a few artificial lakes. The courses of the hills may be treated running in narrow chains, frequently dipping under the soil and reappearing at short intervals of a mile, stretching northward on extensive alluvial plain as far as the Yamuna but different from the familiar Gangetic doab, at its treelessness paucity of villages and predominance of waste lands.

The rivers are Yamuna, the Betwa, the Dhasan and the Ken. They are swellen to considerable dimensions during the rains. At other times, they are narrow streams with some discharge. They have steep gradients and their course is tortuous and frequently bring considerable area within the reach of their destructive action.'[4]

PHYSICAL ENVIRONMENT OF LALITPUR: Jhansi was the second biggest district of Bundelkhand but due to the large area and special physical structure, there were difficulties in the

development of the district. So, U.P. Government separated Lalitpur town from Jhansi in a separate district. Jhansi is situated at Northern part, Saugor at South, Tikamgarh at East and at the Western part is situated Guna.

According to the census of 1971, the physical area was 5045 square kilometers and population was 426742.

It is divided into six parts viz. (1) Talbehat (2) Jakhora (3) Birdha (4) Mehroni (5) Madawara and (6) Bar.

Because it is situated at the plateau part, the land is also plateau and rocky. Lalitpur is divided into two sub-parts; one part including Talbehat, Jakhora and Bar and the other consists of Mehroni, Madawara and Birdha. [5]

In sub-part I there is Parwa and rocker soil. The colour of soil which found in plateau part is red and it is rocky and also known as Bundelkhand type I. Bundelkhand type II is known as rockier which is found on the lower part of valley. Sub-class include mainly southern part of the district. There are present lengthy plain fields and rocky parts in sub-part II.

PHYSICAL ENVIRONMENT OF BANDA: The Vindhyan range forms a sort of natural boundary in the South and the chain hills extend into Panna and Chattarpur States. Some of the hills

around Karvi have Chitrakute at 1700 feet elevation which is an important place of pilgrimage. The Yamuna valley on the extreme North extends for a depth of some four miles along the river and then the elevation gradually rises upto the base of the Vindhyan ranges where the gradients are steep. There are two large uncultivated pasture grounds in the hills of Kalinjor and Marpha where sharifa trees grow abundantly. Besides the Yamuna the most important rivers are the Ken, Baghain and the Paisuni which rise in the Vindhya range hills. Their course is marked in a deep winding bed, scoured through innumerable ravines and after broken across by falls and cataracts whose rocky barriers have prevented an uniform gradient. During the rains they roll down large volumes of water. When the wet season is over, they gradually dry off.

Banda is situated at the East of the Jhansi district. It is present at 24.53° and 25.55° North and 80.07° and 81.34° East directions. Fatehpur present at the North, Satna, Panna and Chattarpur at Southern part, Allahabad at Eastern part and Hamirpur is present at Western part.

According to the Surveyor General of India the area of Banda district is 7645 kilometers. It is divided into two

sub-regions. First region contains Mau and Karvi which include five developing areas :-

(a) Mau
(b) Ram Nagar
(c) Manikpur
(d) Pahari and
(e) Chitrakut

The Second region comprises of Banda, Baveru and Nareni tehsils.

The flow of water is from South to North in which seven rivers flow and they meet with Yamuna at different places.[6]

PHYSICAL ENVIRONMENT OF JALAUN: It is the Northern part of Jhansi district. It is surrounded by Yamuna on North, Betwa on South and Pahuj at West. It is situated at 26.27° and 25.26° northern pole and 29.52° and 28.56° east direction line.

The general appearance of Jalaun district is far different from other parts of Bundelkhand. The district is covered entirely by alluvium, except for the rock outcrops near Sayeednagar. Beyond the Mar and Kabar plain stretching northward, lies a natural tract in which the soil is mixed with Parwa and darker element gradually disappears. Further

beyond the bordering of the Yamuna, lies a region of almost white loamy earth like the soil of the doabs. Here the villages are thicker, cultivation is much closer and Mathva and Ganga groves make the landscape more pleasant. Surrounding this central tract on every side except the extreme southwest lies the ravine girdle of barren undulations in the neighbours hood of the main rivers. [7]

2. CLIMATIC CONDITIONS & RAINFALL:

THE MONSOONS: The greater part of Bundelkhand is peculiarly situated on the Indian subcontinent with respect to monsoon winds. Although it lies in the independent fields of both the Arabian sea and the Bay of Bengal, it falls on the fringes of the lines of influence of either of the two monsoons. The result is that though the areas of low pressure are formed with a certain degree of eccentricity and uncertainty, there is often a tendency for cyclonic storms forming in the north of the Bay of Bengalto advance along this area and cause heavy bursts of rain. When a season is characterised by a long number of cyclones, the rainfall is excessive; on the other hand, quite frequently, there are long breaks even if heavy falls may occur occasionally. Although normal rainfall may be obta ined in total value, the distribution over the monsoon

season is not evenly spread.

CLIMATE: The climate of Bundelkhand due to the rocky nature, absence of jungle and the general depth of water level is characterised by exceeding dryness and heat considerable above the State average. The intense heat of May and June is followed by pleasant weather in the rains. In the winter it is dry and chilly. The coldest month is January with average temperature 18°C. May is the hottest with 36°C. The maximum has often exceeded over 49°C.

SUMMER: The summer is characterised by heat and dryness. General absence of trees and vegetation intensifies the dazzling blaze during the hottest time of the year. The summer as a rule is longer, hotter and drier than it is in the districts across the Yamuna. Hot weather commences in March and reaches its greatest intensity just before the break of monsoon rains. When the monsoon is delayed, the heat becomes intensively drying. Hot west winds of April and May begin to blow as early in the morning as 9'0 clock and continue uninteruptedly until night fall. In the southern hilly parts and their vicinity, the heat is accumulated during the day by the numerous rocks and radiated at night, rendering the heat more severe. Dust storms are of less frequent occurance

and the air is generally clear. This feature in part accounts for the severity of heat which renders exposure to the sunny blaze dangerous to life. Usual maximum summer temperatures range around 116°F and temperature upto 120°F are not unfrequently recorded during the intense and prolonged hot weather that often prevail.

Of all places in Bundelkhand, Jhansi is the hottest district in Uttar Pradesh. Taking the Indian subcontinent as a whole, it was next to Jacobabad (Sind). In the present India, Jhansi has often beaten the record of the maximum temperature and is in close competition with hottest cities. However, the night and early morning hours are somewhat cool and bracing but the wind is dry.

RAINY SEASON: The monsoon usually burst in the last week of June and continues steadily till the end of August when there is a long break. Storms sometimes occur in September followed by occasional rains in October. But the rainfall is uncertain and is not dependable.

The weather improves considerably after the first shower. The rocky nature of the ground and the rapid drainage do not allow shrinking effects of rainfall to occur and they prevent large pools of stagnant water forming all

around. The nights are pleasant and a breeze is rarely absent.

WINTER: The cold weather is somewhat slower in approach and the middle part of the dry November is fairly warm. The duration of winter is short in all the districts of Bundelkhand in comparison with the other parts of the Province. During December and January the hot days are succeeded by very cold nights. Although the air is dry and chilly, there is seldom any frost.

GENERAL CLIMATE: The general climate is good, more particularly as it is dry. Normally good climate should make people healthy and increase their immunity against diseases. But the shortage of drinking water and the scantiness of adequate supply of food have been great drawbacks for the growth of population. Spring level is low. Being 30' to 60' below ground, wells are most difficult to dig in the rocky strata. Even in the black soil wherever wells are made, they seldom retain water during summer when it is needed most. The uncertainty of rain and the absence of wells have ruined the agriculture which is the main stay of the people.

Although the climate is dependent on natural conditions, some of the evils which are caused by unfavourable

natural conditions can be encountered by human efforts. In the case of Jhansi district the greatest drawback arising from climatic conditions is the deficiency of water both for drinking and also for agriculture. But nature has endowed the area with good average rainfall. By constructing storage reservoirs in suitable places, rain water can be stored in plenty to alleviate clusters that occur due to shortage of rainfall and the stored water can be distributed far and wide by canals.

GENERAL CLIMATE OF JHANSI: The summer of this district is very hot and dry and winter is very cold. Maximum and minimum temperature from 1974-1977 was 34.2°C and in 1978 the minimum temperature was 2.3°C and maximum was 44.6°C.

GENERAL CLIMATE OF JALAUN: The climate of this district is more dry in comparison to other northern districts of Yamuna because it is situated near the tropic of cancer. Summer starts soon and continues for a long time, the winter is also dry so there is no more effect of frost and mist. The annual average temperature is 27°C, it decreases upto 3.4°C in January and 30°C in May.

GENERAL CLIMATE OF BANDA: The climate of this district is similar to middle India in which summer is characterised by hot and winter by more cold. The summer starts from the middle

of March and continues to the first week of July. In this period winds are hot and they are full of dust storms. In the summer the temperature is 35°C - 50°C. Hot winds affect the green vegetation very much. In this period wells, ponds etc. become dry and there is also shortage of drinking water. Summer nights are cold.

GENERAL CLIMATE OF HAMIRPUR: The climate of this district is totally dry and hot. The summer is hottest but at nights the temperature decreases. The winters are very cold.

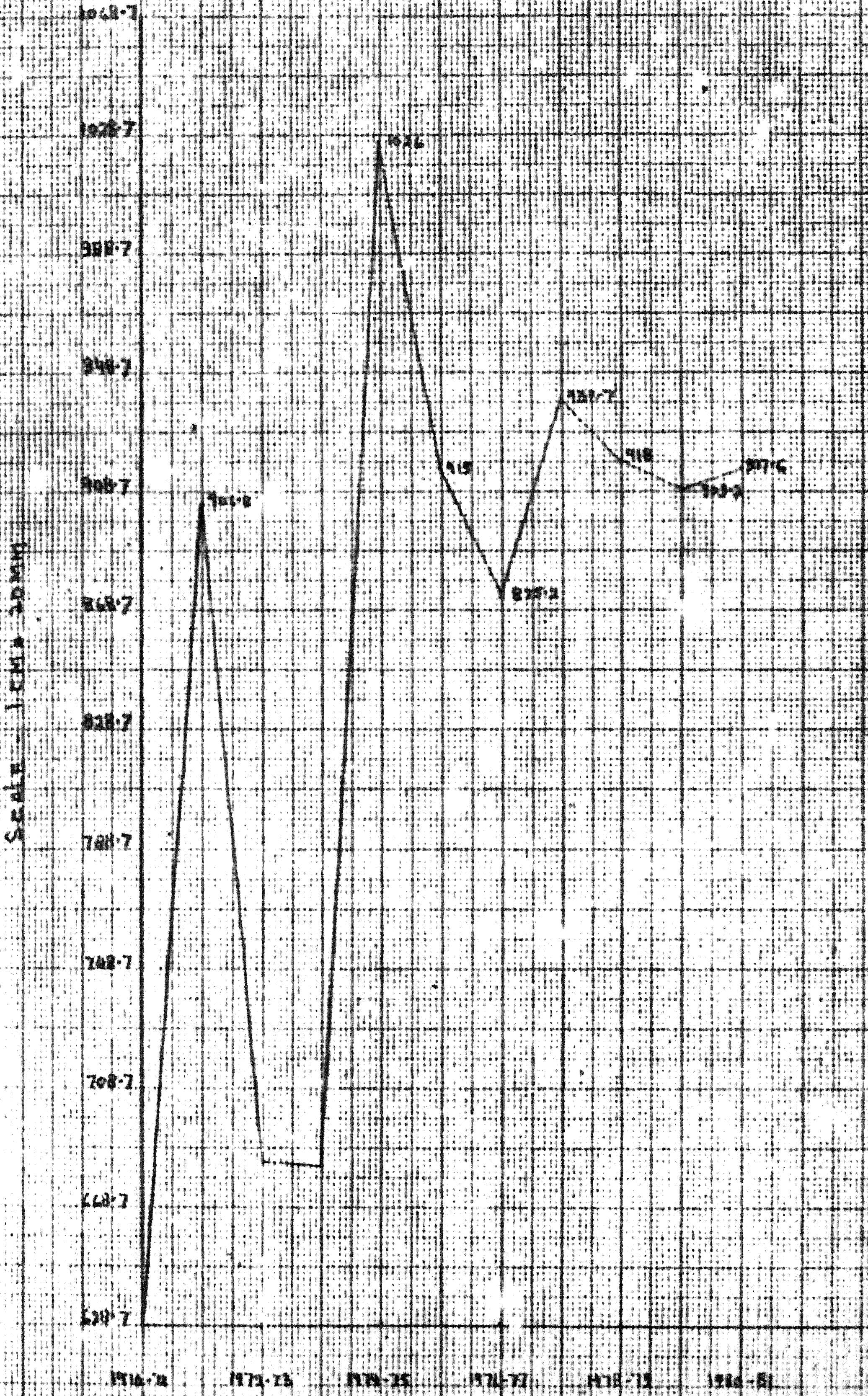
GENERAL CLIMATE OF LALITPUR: The climate of this district is different from the other regions because it is situated at the rocky region of the State. The summer starts very soon and survives for a long time. The maximum temperature is 44°C and the minimum is 3.7°C.

RAINFALL: "According to the meterological records of the last 50 years, the average rainfall in the region varies from 782 mm to 946 mm. The rainfall is, however, very eratic as would be evident from many instances.

Rainfall at Raiza Rainguage station in district Hamirpur recorded in 1964 was 229 mm. only.

Rainfall at Mauranipur in the year 1964 was 259 mm.

RAINFALL
(a)
JHANSI



Scale - 1cm = 1year

There was continuous draught in the region from 1964 to 1966 in Mauranipur (district Jhansi) where the rainfall was as under:-

1964	..	259 mm.
1965	..	417 mm.
1966	..	674 mm.

Rainfall at Matatila (Jhansi) during three years was:-

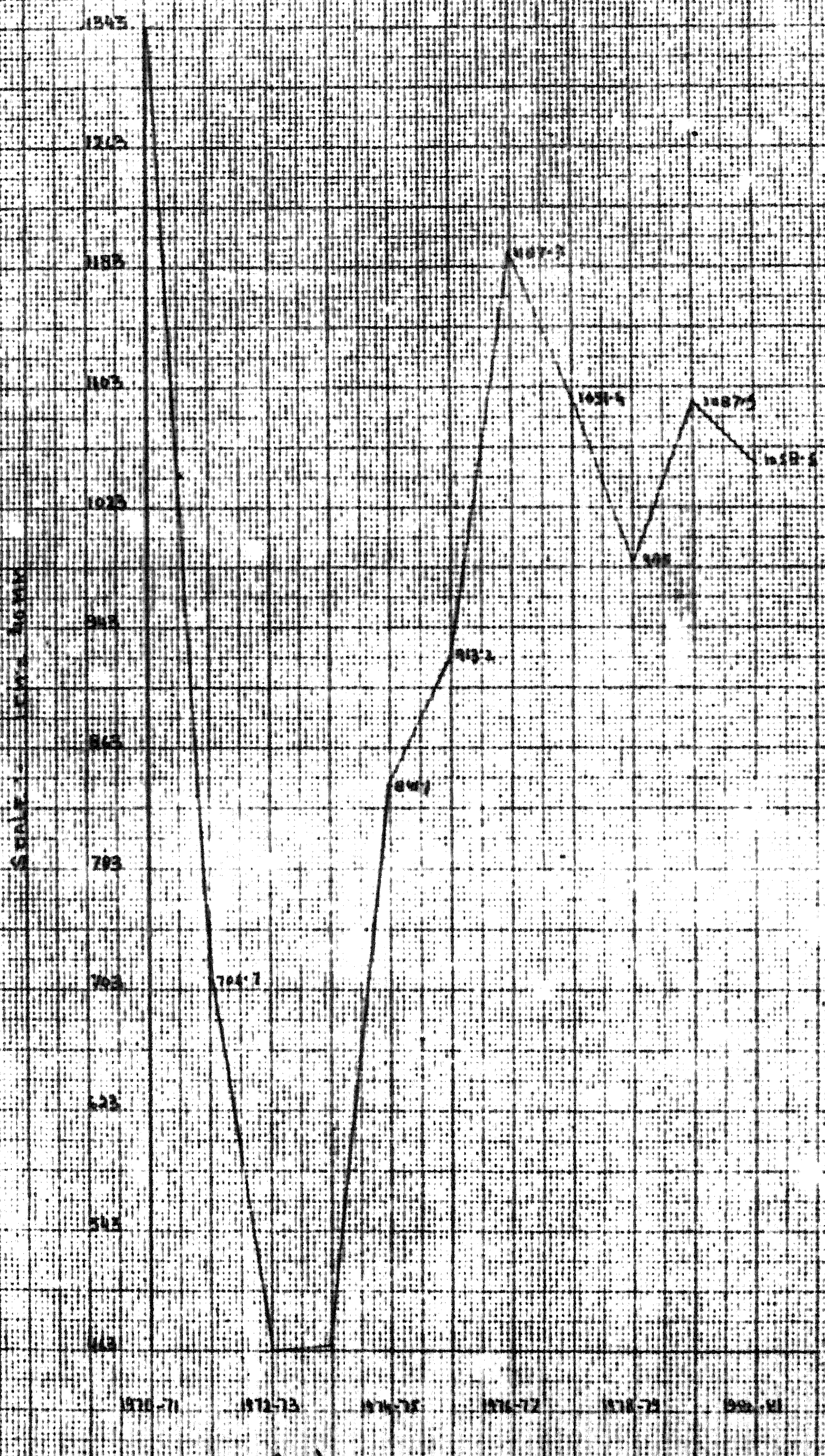
1964	..	437 mm.
1965	..	390 mm.
1966	..	385 mm.

The uptodate rainfall during 1974-75 upto August has been 769.35 mm. In the present kharif the rainfall was delayed by 25 days, but has continued daily till August 23,1974 due to which some of the agriculture operations have been delayed and some area has remained unsown, but as it had filled reservoirs, therefore enough water will be available for Rabi."

"Rainfall of Jhansi in different years is as below:

Year	Rainfall
1970-71	628.7 mm.
1975-76	915.0 mm.
1978-79	918.0 mm.
1980-81	917.6 mm.

RAINFALL
IN
JALAUN



JALAUN: In Jalaun, rainfall is lesser than other regions. The normal average is 1029 mm.

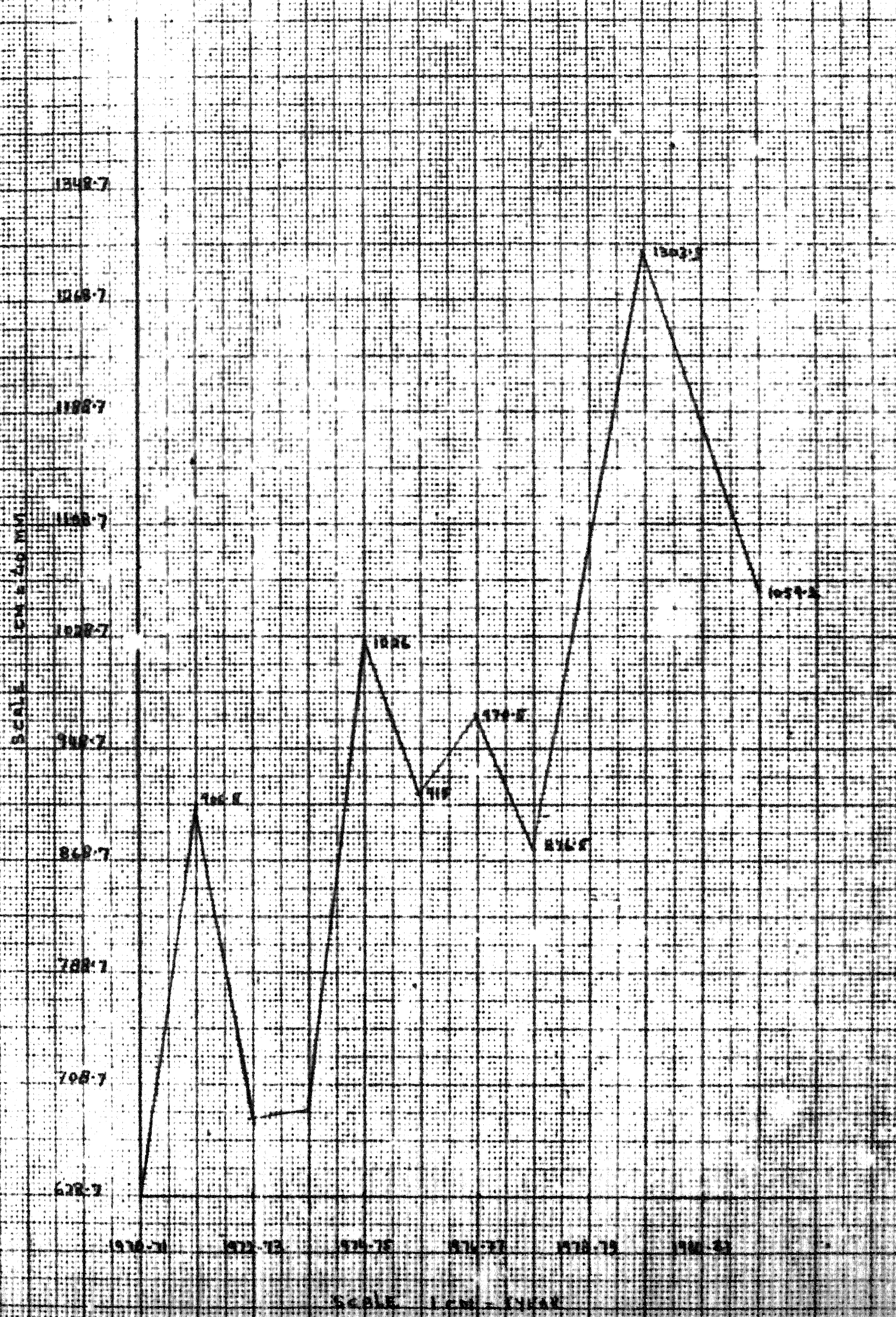
Year	Rainfall in mm. Normal	Real
1969-70	1029.33	1022.7
1970-71	1029.3	1361.1
1971-72	1029	706.7
1972-73	1029	463.9
1973-74	1029	463.9
1974-75	1029	841.1
1975-76	1029	913.2
1976-77	1029	1187.3
1977-78	1029	1091.4
1978-79	1029	985.0
1979-80	1029	1087.9
1980-81	1029	1058.6

BANDA: Rainfall starts from the first week of July to the middle of October. The average rainfall is 980 mm. There is no rainfall in winter or it is very little."

Year	Rainfall in mm. Normal	Real
1969-70	917.6	1124.9
1970-71	917.6	628.7
1971-72	917.6	906.8
1972-73	917.6	683.8
1973-74	917.6	689.4

RAINFALL IN

BANDA



Year	Rainfall in mm. Normal	Real
1974-75	917.6	1026.0
1975-76	917.6	915.0
1976-77	917.6	970.5
1977-78	917.6	875.8
1978-79	917.6	1089.0
1979-80	954	1302.9
1980-81		1059.8

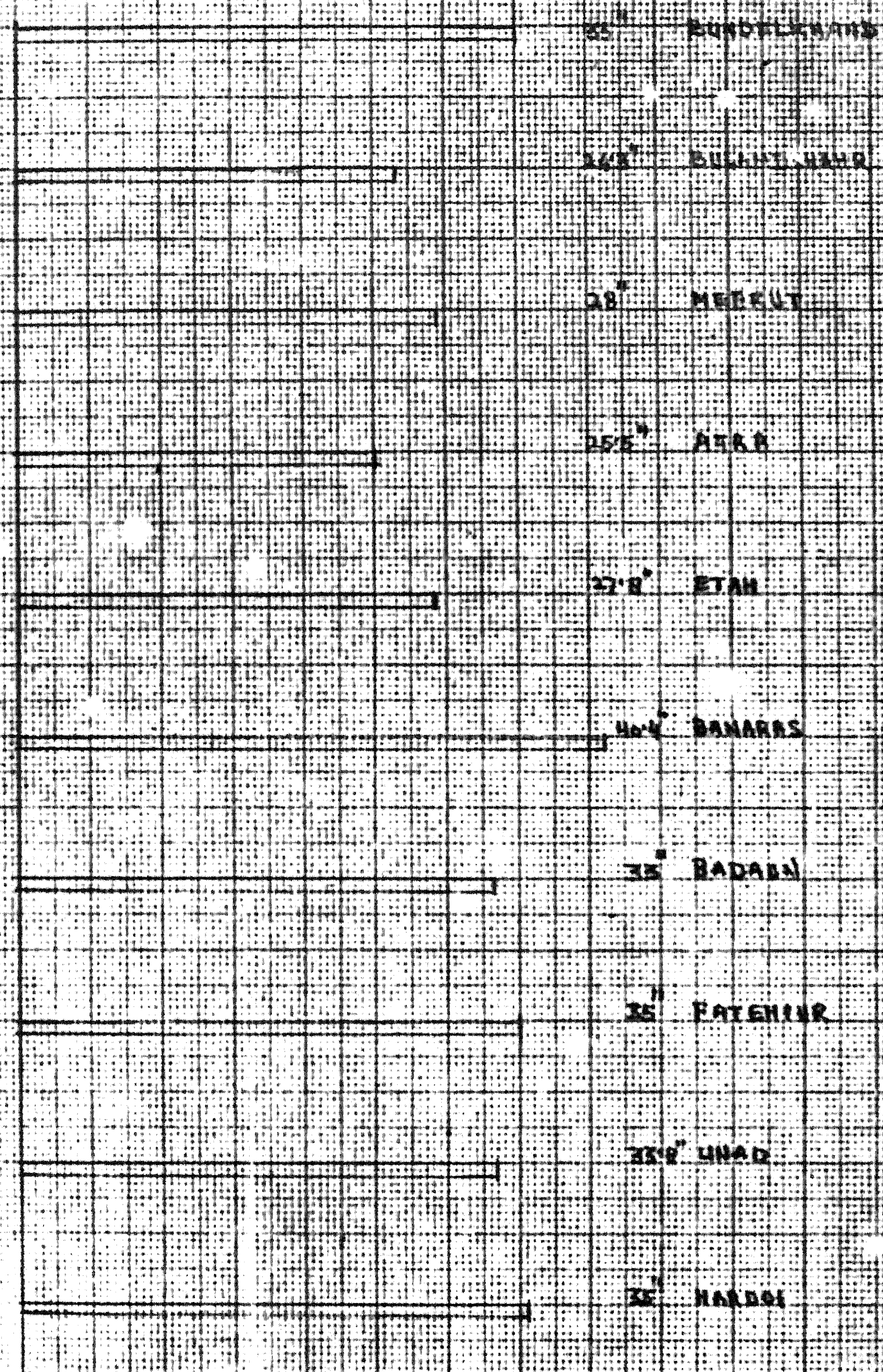
HAMIRPUR: "The rainfall in Hamirpur is normally less. In 1978-79 the rainfall was 445(total) and 37.1 (average) while in 1979 it went down and it was 437.8 (total) and 36.5 (average)."

LALITPUR: The normal average of rainfall in this district is 917.6 mm. which is less than the plain area of the State. Rainfall is mainly in summer season but in winter the average of rainfall is only 4 mm. In 1978-79 the normal rainfall was 1101 mm. and average rainfall was 1227 mm."

Of all the areas of Bundelkhand, Lalitpur has an appreciably higher incidence of rainfall than the other parts.

NORMAL RAINFALL: Normal rainfall of Bundelkhand is 35 inches. As far as comparisons are concerned with the total annual rainfall, Bundelkhand districts may stand at par and even better with many other districts in the Gangetic plains, as

NORMAL RAINFALL
IN
INCHES



SCALE 1cm = 5 INCHES

shown below:-

Districts	Normal rainfall (in inches) Novr. to March	April to Octr.	Total rainfall (in inches) 1910 - 1958
Bundelkhand Districts	1.5	33.5	35.0
Bulandshahar	2.3	24.0	26.3
Meerut	3.0	25.0	28
Agra	1.5	24.0	25.5
Etah	1.8	26.0	27.8
Banaras	2.2	38.2	40.4
Badvan	2.4	30.6	33.0
Fatehpur	1.8	33.2	35.6
Unao	1.9	31.9	33.8
Hardoi	2.0	33.9	35.3

Bundelkhand districts suffer most in the matters of rainfall - it is on account of uneven distribution during the monsoon and winter season. Heavy falls during monsoon succeeded by long break, are most damaging to Khariff crops. The result is that cotton and maize have almost been completely eliminated, even though they tend to improve the economic value production from the land. The main Kharif crops is jowar, the poorest of all the food grains in its market and nutrition value. Winter rains are also eccentric as they do not always come at the right time. Often it happens that there are falls

in February and March which cause rust and become very harmful to Rabi crops.

CONDITION OF RAINFALL: Excessive rainfall render the black unworkable and tend to promote the growth of the notorious deep rooted grass which spreads like a pest. Kans has got so widely spread that many thousands of acres of cultivated land has been left out as being beyond the means of reclamation of ordinary cultivator. In recent years, Government have been reclaiming a part of the land by deep ploughing through heavy tractors and have successfully handled over one lakh acres land in various parts of Bundelkhand. The cost of reclamation is about Rs.65/- per acre, but the first two crops alone, after reclamation pay far almost trebled. The experiment has been widely acclaimed. This is one of those typical cases where many obstacles prevent the resources of the community from being distributed in the most effective way on account of deficiencies of organisation. In such cases it is possible for the Government to play its role with economic welfare of their citizens as a whole. One way of disposal may have been to leave the land for free play of self interests so that people may be able to apply local resources for the improvement of the Kans ridden land. But when the urge for greater

food production became apparent, and when it was observed that large cultivated areas had fallen out of cultivation on account of forced neglect, it became the duty of State to have come out for the assistance of the cultivators and to have adopted measures which were beyond the means of their citizens. The introduction of tractor machines for deep ploughing by Government is not a case of interference with private enterprise but constitutes a net additions to the sum total of resources in existence.

Returning to the main subject of the conditions of rainfall, lighter soils suffer as much by excessive rains as do black heavy soils, but in a different manner. In the case of lighter soils, the upper crust which contains the best part of the agricultural soil, is washed away by heavy falls, and the deep drainage have a tendency to cut back and damage adjacent field plots thereby.

The worst calamity due to uneven distribution of rain comes when July and August have good rainfalls but September and October leave the soil too hard for Rabi sowing.

The vagaries of weather in relation to agriculture can best be controlled by means of irrigation where again State aid is essential to ensure National dividend to save

peasantry from uneconomic bargaining.

ABNORMALITIES OF RAINFALL: The abnormalities of rainfall during the last 80 years for Jhansi district, as an example, are:-

Year	Station	Rainfall in inches
1868	Mehroni	12.1
	Narhat	10.1
1894	Mehroni	75.6
	Narhat	69.1
1901	Jhansi	58.1
1905	Moth	11.0
	Garautha	10.6
1913	Jhansi	13.3
1950	Lalitpur	48.9
1958	Lalitpur	41.4
1979	Lalitpur	12.27
1981	Jhansi	37.4

In comparison with the normal of 35 inches, the extreme mentioned above show how eccentric has been the rainfall in these parts and how great is the need for protecting the people in years of draught. The reduction of population in Census 197 , 1901 and 1921 are directly due to the calamities caused by the abnormalities of rainfall in the year of proceeding the census. The period after 1921 was comparatively easier from the point of incidence as also of distribution of rainfall. As a result a progressive increase in population has been maintained in the last thirty years.

Relatively speaking increase in population is accompanied with a certain degree of prosperity however small it may be in measure. There is no doubt that prosperity of the people has somewhat improved during the last two decades, but human part in shaping this prosperity is much less than what has been bestowed by nature in the form of a long spell even rainfall over a continuous long period.

3. TOPOGRAPHY:

The general landscape is that of bare undulating plains, relieved by confused rocky hills or ravine edge river beds and succeeded by an unattractive level expance of black cotton which reaches northwards to the Yamuna through the district of Jalaun, Hamirpur and Banda. The southern parts have numerous outcrops of gneiss rock, tending to cluster into low ranges surrounded by uneven broken country and overgrown for the most part with started jungle. These numerous pyramidal rocky islands rise abruptly before reaching the uplands of the Vindhyan. They are more numerous in the south and west of Banda district, extending across the Ken river into Hamirpur district, near Mahoba and appearing again in the western and southern parts of Jhansi district.

Vindhyan ranges from the southern forntier of

Bundelkhand and the elevation is about 2000' above sea level. The formation is of granite and syenite overlaid commonly by trap and some other formation regarded to be of volcanic origin. The Panna range in the south of Banda has deep ravines followed by thick bed of sandstone overlying primary rock and in some places overlaid by trap of volcanic origin. The area is remarkable for inclosing diamond bearing strata which have made a name for Panna and golkunda diamonds. In the southwest of Bundelkhand lies the Bhadair range with an average breadth from 15 to 20 miles with an elevation of about 1800' above sea level. The outer limits of the hilly tract is marked by abrupt isolated hills which were at one time sites of strong holds of local rulers. This is followed again by black cotton soil in which rocky outcrops lessen and finally disappear towards the west, but which in the east marked by long rocky ridges and is scarred by deep bedded streams which terminate in a range of hideous ravines. River Sindh which emerges out from Malva towards Bundelkhand at its west corner and turning northeast for about 150 miles to its junction with the Yamuna, forms generally the boundary with Gwalior. 15 to 20 miles eastward flows its tributary river Pahuj which joins the greater stream. River Betwa emerges out near Bhopal passes

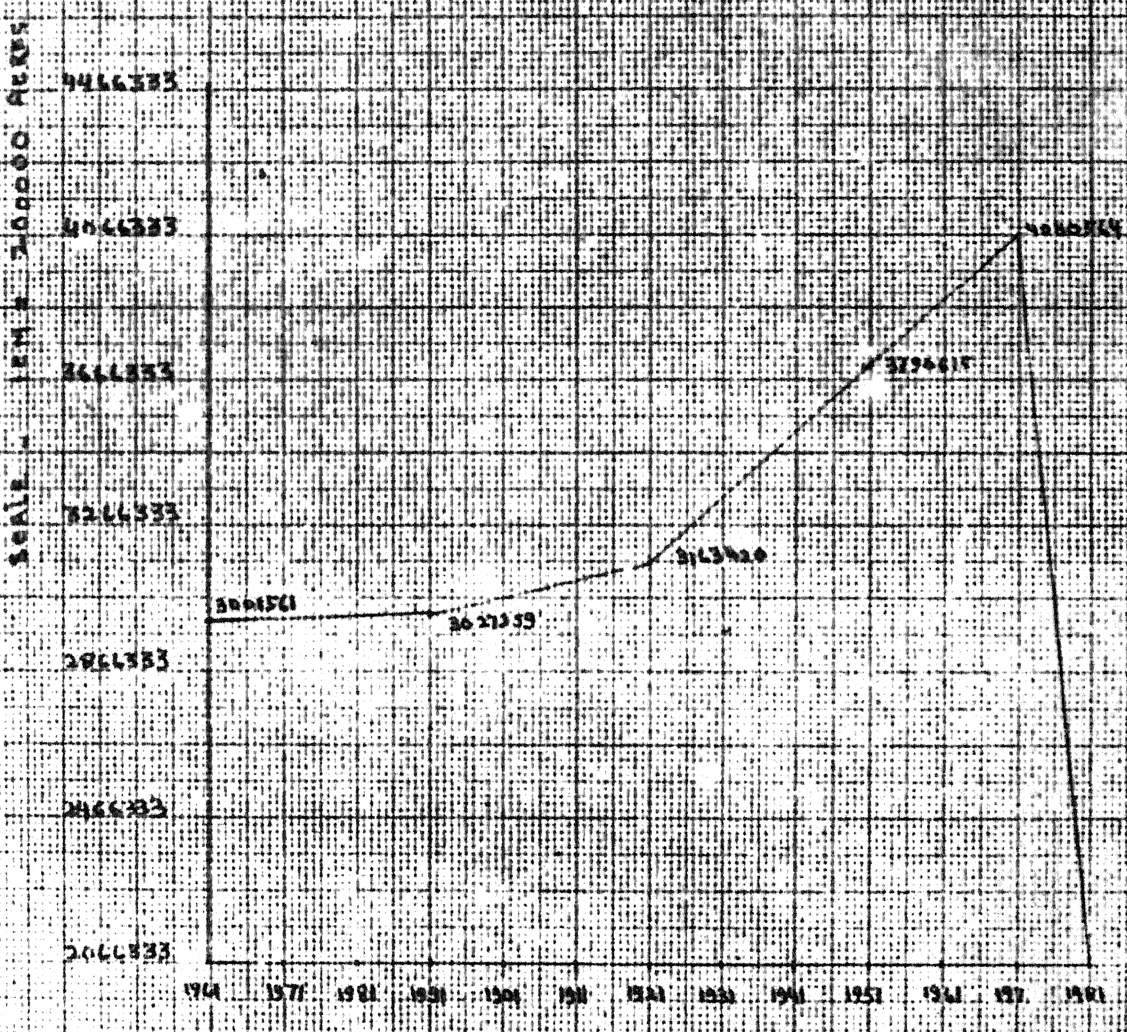
through Bundelkhand for about 190 miles before joining Yamuna. River Dhasan, the tributary of Betwa, flows from south to north has a course of about 150 miles. Below the confluence of Betwa and Dhasan is a small river, Birma, flowing northward, on the east is the great river Ken rising from south and flowing towards north and falling into Yamuna after a course of about 330 miles in Bundelkhand. On the east are Bhagain and Paisuni flowing from southwest to north-east and joining themselves into Yamuna. Yamuna first touches the tract of northern extremity forms it northeastern boundary to a distance of about 250 miles and it is navigable in all seasons. Most of these rivers flow from the elevated table lands which usually do not have permanent sources of water like the snows, and which depend on the rains for the supply of water.

4. AREA UNDER CULTIVATION IN RELATION TO POPULATION:

The majority of the people are dependent on agriculture and allied occupation for their subsistance. According to the basic data about 55 per cent are cultivators and 30 per cent work as agricultural labours.

The trends of population along with cultivated and irrigated area during the period 1861 and 1981 are :-

AREA UNDER CULTIVATION
IN
BUNDELKHAND



Year	Population	Cultivated area (in acres)	Irrigated area (in acres)
1861	22,56,505	30,01,561	62,246
1891	21,61,585	30,27,259	86,382
1921	20,65,297	31,60,420	3,41,344
1951	28,88,297	37,90,648	4,99,891
1971	42,90,918	40,80,564	4,01,964
1981	92,55,824	20,66,333	5,71,204

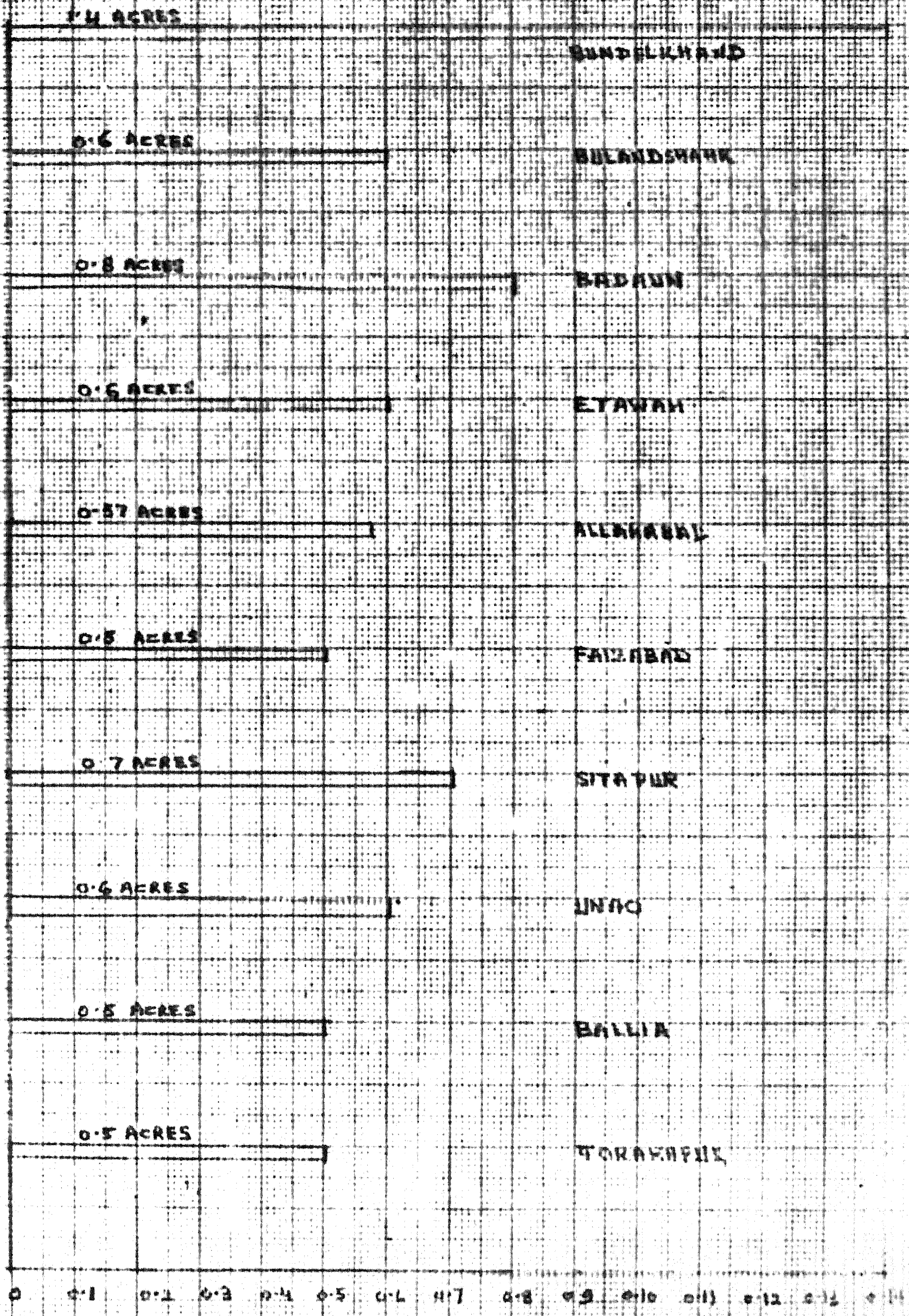
EFFECT OF ECONOMIC PROGRESS ON POPULATION:

The statistics of population and of cultivated area which gives occupation to the greatest number of people are very illuminating. There is no appreciable change in the number of people between the years 1861 and 1981. This shows the trend of economic progress. It leads to the conclusion that Bundelkhand received only a small share of economic development actitivities which bring prosperity and rise of population. In the same period, the cultivated area and also the population in other parts of Bundelkhand had increased.

"The period from 1921 to 1951 is more significant. In these thirty years, Uttar Pradesh increased its population by 37 per cent and the cultivated land by 18 per cent.

In Bundelkhand the increase in population in this period is 40% and the increase in cultivated area is from 30 lakhs acres to 41 lakhs acres or 37%. This shows that the

CULTIVATED AREA PER HEAD



SCALE : 1CM = 0·1 ACRE

pressure of population on cultivated land increased in Bundelkhand in the same proportion, as the cultivated area itself. Whereas the pressure of population on cultivated land increased appreciably on the cultivated area in Uttar Pradesh as the increase in cultivated area was not proportionately as great.

The density of population in 1951 in Bundelkhand was 414 per square mile whereas corresponding density for Uttar Pradesh was 560.

During 1805 to 1921, the calamities caused in Bundelkhand by a series of famines and the rapidity with which these famines occured had greatly retarded economic development. Of early famines there is no record. But famines are known to have occured in 1753, 1833, 1837, 1847, 18 9, 1895, 1896, 1897, 1899, 1907, 1913 and 1919. Scarcity conditions occured not only due to draught but also from excessive falls of rain and by bad distribution."

"Other features of the population are :-

Rural	24,53,328	85%
Urban	4,35,194	150%
Total	28,58,522	
Agricultural	21,65,133	75%
Non-agricultural	7,23,389	25%
Total	28,88,522	

Density of Population is :-

	1921	1931	1941	1951	1971	1981
Bundelkhand	187	203	231	248	287	319

Area of cultivation in acres per capita is :-

	1921	1931	1941	1951	1971	1981
Bundelkhand	1.3	1.3	1.2	1.4	1.8	2.5

Total area in acres per capital is :-

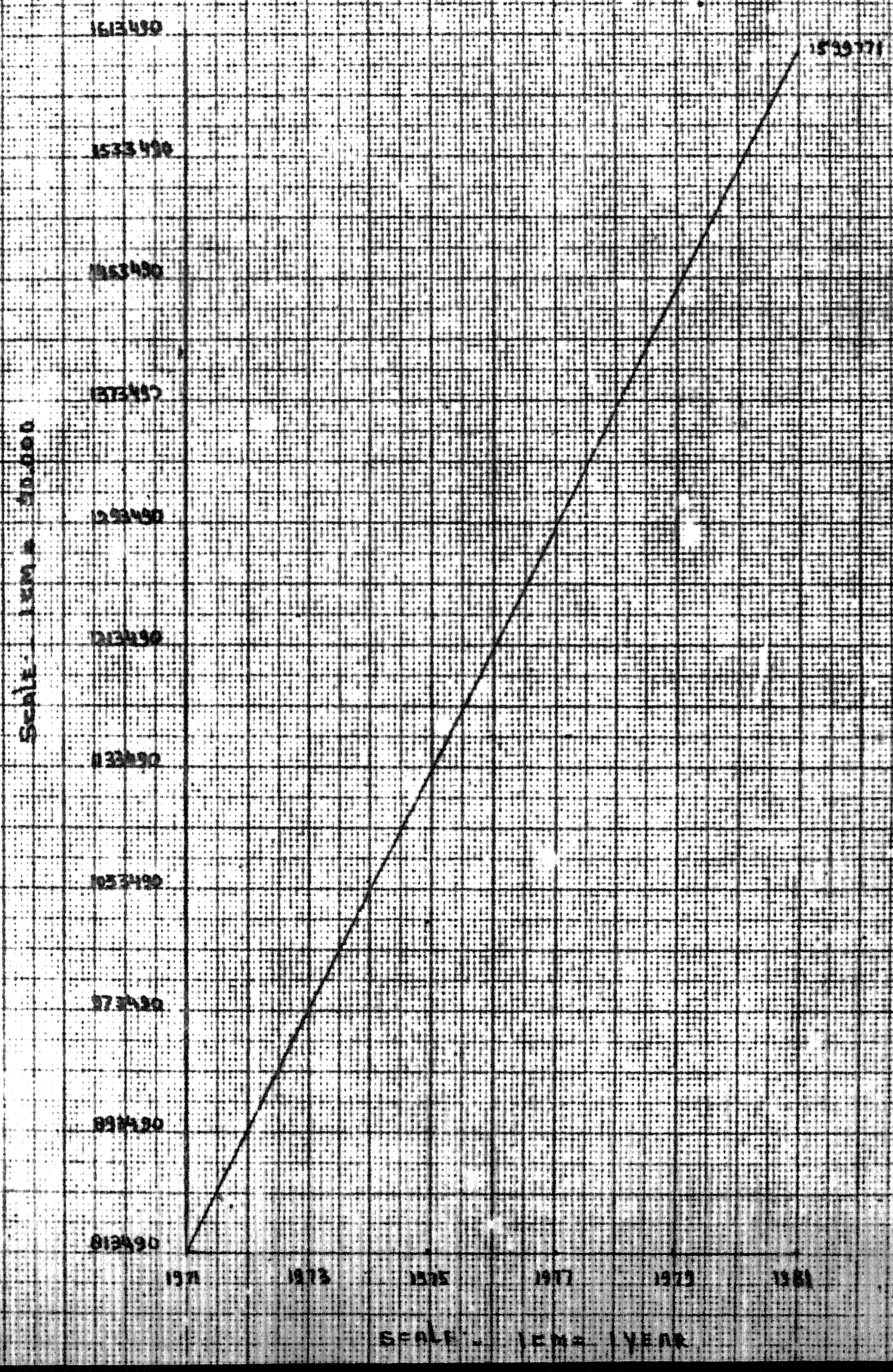
Bundelkhand	..	2.5 acres
Uttar Pradesh	..	1.15 acres

"According to the 1971 census, the total population of Bundelkhand was 42,90,978". The intensity of the region worked out to 150 per square kilometre against average of 301 per square kilometre for the State as a whole. The district-wise figures of population are :-

	1971	1981
Lalitpur	4,36,741	11,72,056
Jalaun	8,13,490	15,99,771
Hamirpur	9,88,219	22,99,165
Jhansi	8,70,108	11,37,714
Banda	11,82,215	30,77,118

What is significant is the cultivated area per head of population and scope for improvement. In this respect Bundelkhand alone has made a great mark by increasing the area of cultivation per head inspite of appreciable rise in

POPULATION
IN
JALAUN



the population. On the other hand the pressure on the cultivated area has greatly increased in the eastern districts of U.P. with the rise of population.

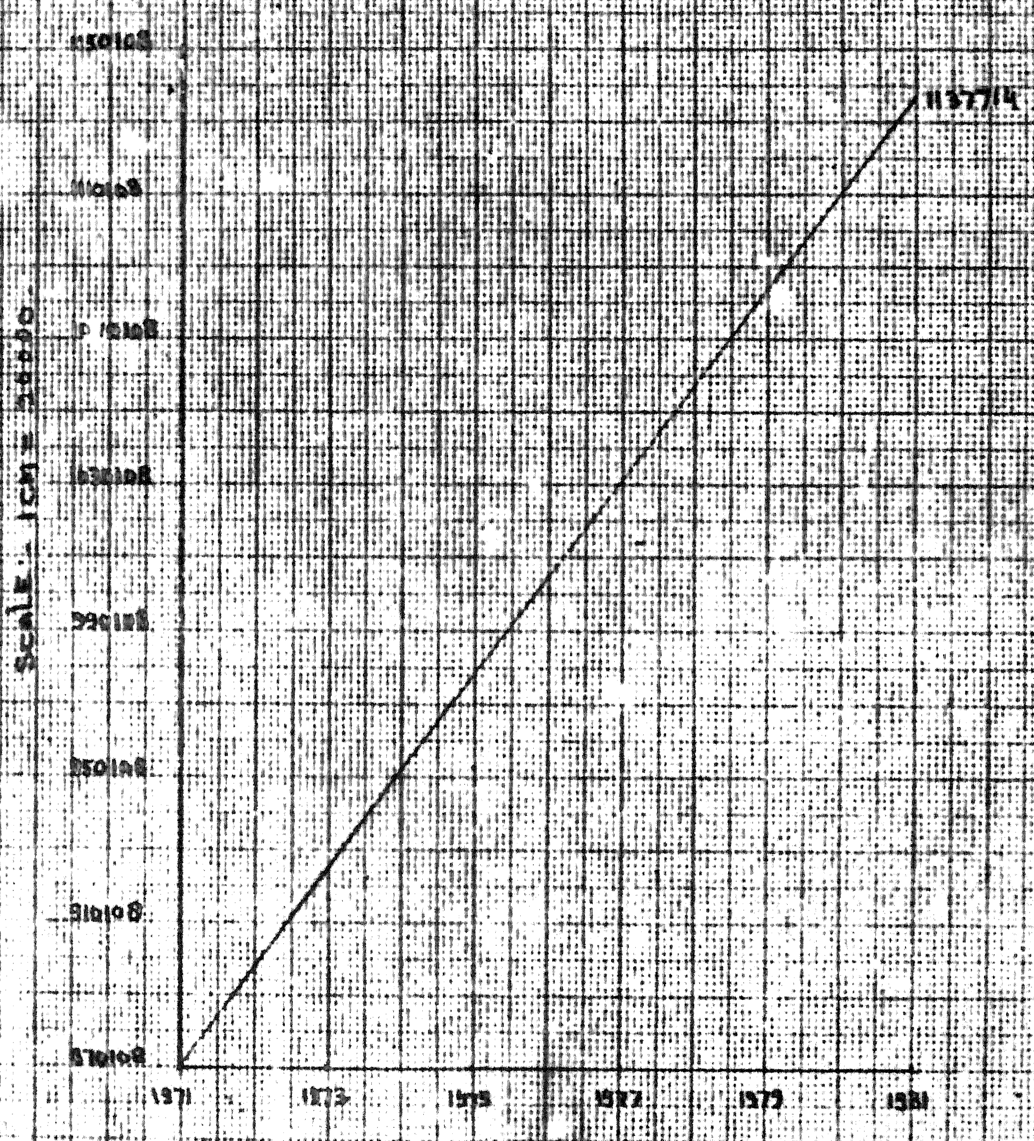
The annual rate of the growth of population in the region has been about 2%. 85% of the population of Bundelkhand remained scattered in the villages with 500 to 2000 inhabitants.

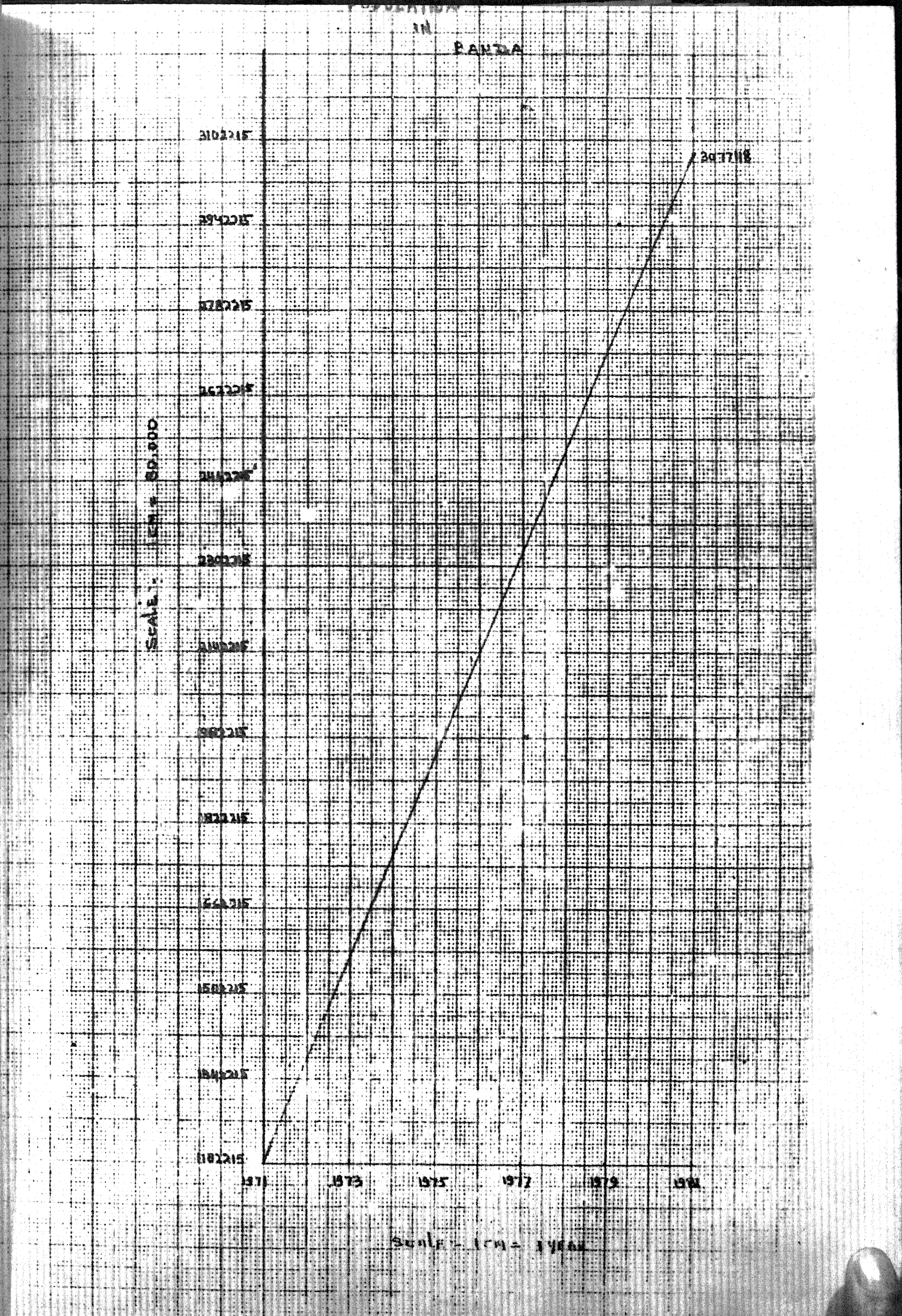
POPULATION OF JHANSI: Density of Jhansi was 172 and 139 per sq. km.

District Jhansi is divided into eight regions viz., Chirgaon, Samthar, Gursarai, Mauranipur, Ranipur, Babina, Hansari and Jhansi. According to the census 1951, 1961 and 1971 the population of these areas was as follows:-

Area	Population:		
	1951	1961	1971
1. Chirgaon	5,460	7,514	9,012
2. Samthar	8,920	9,449	11,708
3. Gursarai	4,566	6,504	9,351
4. Mauranipur	1,581	20,224	25,651
5. Ranipur	5,698	70,793	7,769
6. Babina	3,331	13,751	13,275
7. Hansari	3,208	4,010	4,416
8. Jhansi Municipal Board	1,06,333	1,40,217	
Jhansi Cantonment	10,075	21,126	14,903
Jhansi Railway	4,057	8,369	9,940
Jhansi City	1,27,365	1,69,712	19,833

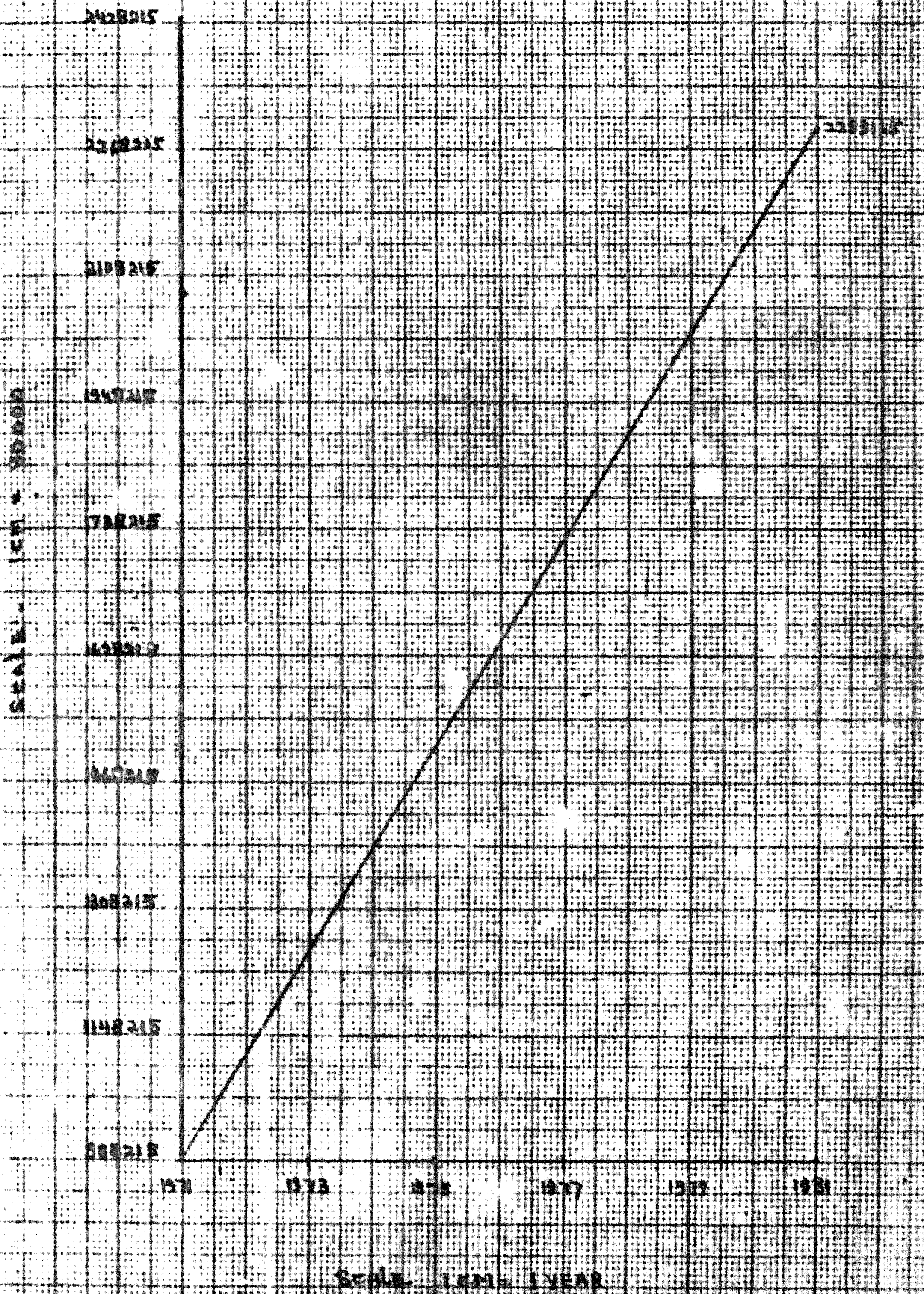
POPULATION
IN
THANE





POPULATION
IN
BANDA
3102215
2942215
2782215
2622215
2462215
2302215
2142215
1982215
1822215
1662215
1502215
1342215
1182215
3077118
1971
1973
1975
1977
1979
1981
SCALE : 1cm = 80,000
SCALE - 1cm = 1YEAR

POPULATION
IN
HAMIRPUR



According to the census of 1971 the population is 8,70,105. 28.5% of the total population are workers out of which 18.1% are farmers.

"Population of Jhansi in different years is given below:-

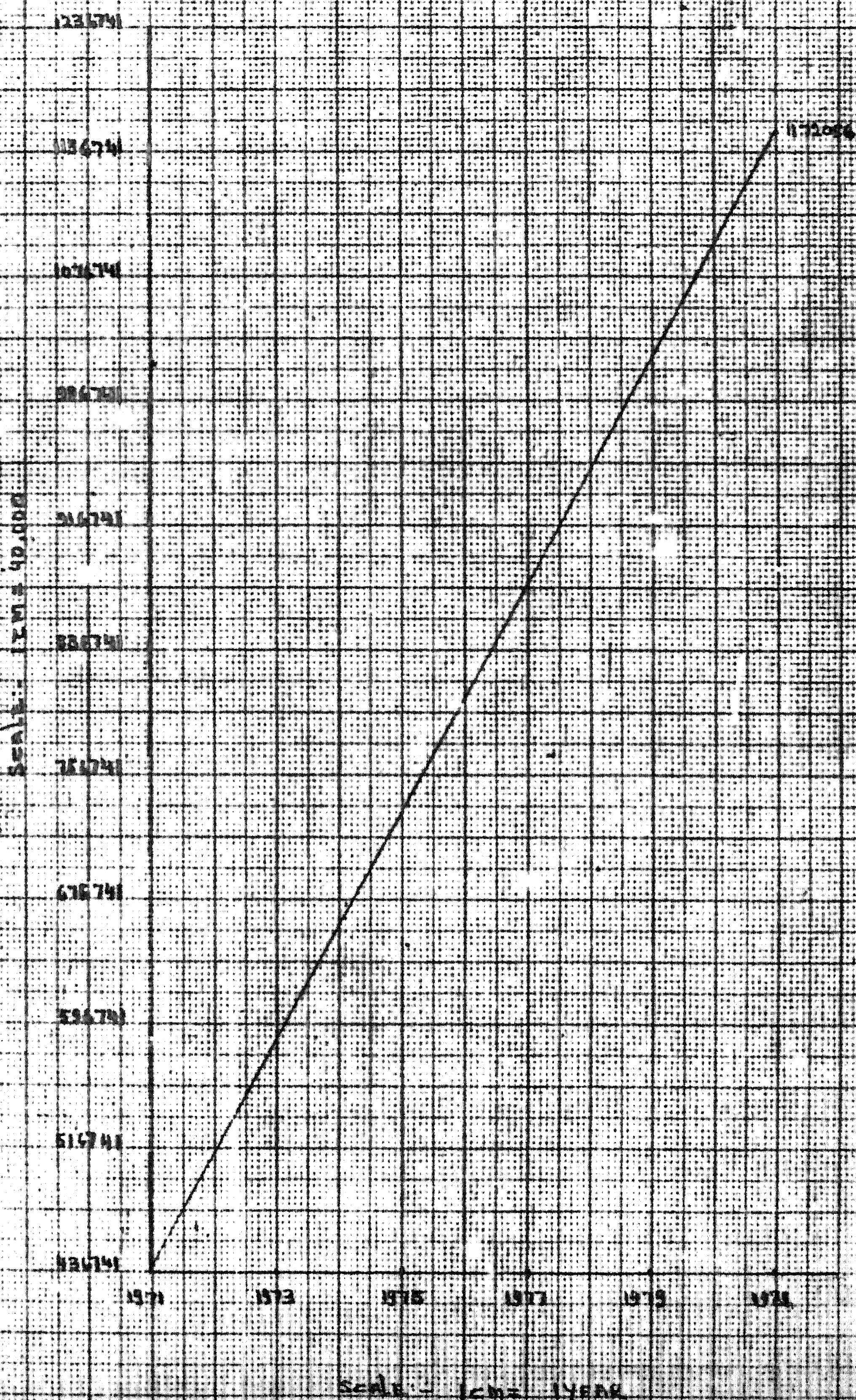
Year	Population (in thousand)
1901	664
1911	728
1921	656
1931	743
1941	834
1951	880
1961	1087
1971	1307
1981	1137

JALAUN: In 1971 total population was 8,13,490 out of which 30.2% were workers. 60.3% constituted agricultural labour."

BANDA: 34.2% of total population are farmers. According to the census of 1971 the population of this district was 1182.2 thousand out of which 403,850 were workers and 226.6 thousand were farmers."

HAMIRPUR: In 1971 the population of this district was 9,88,215 out of which 107,301 were farmers and 1,06,911 constituted the agricultural labour."

POPULATION
IN
LALITPUR



LALITPUR: According to the census of 1971 the total population of this region was 4,36,742 out of which 82.26% were farmers."

5. FOREST AREA:

UTILITY OF FORESTS: The forests of Bundelkhand are the source of several kinds of timber which meet the requirements of buildings, industries in which wood and grasses form the principal raw material. The forests meet the growing demands of urban fuel and of timber required for rural housing. They provide opportunities of grazing hay and fodder. They also yield forest produce like medicinal herbs, charcoal, lac, gum, honey, cane, bamboo and catecho.

Apart from these direct benefits the forests play an important function in protecting soil from erosion. They also the home of rich and varied wild life. Forests stop erosion of the forest soil and make the atmosphere appropriate to agriculture needs. They control the flow of excessive rainfall.

These familiar facts emphasize the compelling need for retaining an adequate proportion of the land surface under forests assured of freedom from encroachment, abuse and over use. In Bundelkhand, forests occupy about 364,000 lakh acres of land or hardly 50% of the total area in addition to

FOREST AREA

the waste lands which occupy 973,000 or 13 per cent of the total area. These waste lands are used for pasturage for the greater part and constitute a type of area which is suitable for growing trees and forests. Combined area is 18% of the total area which is not unsatisfactory as far as percentage of the total area is concerned. Nevertheless a considerable proportion is occupied by forests in name and they are subject to mal-treatment. For example, the area of the waste lands was under the proprietorship of Zamidars. On the evolution of Zamidari system when waste lands were to become the property of Government, the old land owners resorted to indiscriminate feeling of trees in wholesale. This destroyed the wealth of the forests in the course of a few years.

Every advance in industrialization causes increased demand on the forest and their produce. Several industries can make use of wood and other forest products directly and timber is required for the construction of factories and for packaging of manufactured goods.

<u>ECONOMIC DEVELOPMENT OF FORESTS</u>: "Economy is very much affected by forests. Forest policy is to be directed on a long range development of forest resources and its potential as the growth of forests depends upon time factor which

cannot be curtailed. Besides seasonal and soil conditions of Bundelkhand also impose limitation on the suitability of particular species which may be found suitable for production. For economic development, the solution lies in adopting measures for inferior and secondary timber on the one hand and for superior timber on a long range.

For example, schemes can be sponsored for matchwood plantation for match industry, soft and secondary timber for plywood, bamboo for paper pulp, babul for fuel, charcoal with its bark of tanning. Medicinal plant require intensive and controlled cultivation. Minor forests produce some products like cane, catechu, lac, honey and essential oils. Among the list of commercial timber, teak is considered most suitable according to local conditions.[22]

FOREST IN JHANSI DISTRICT: The total forest area in Jhansi in 1960-61 was 2,37,868.62, out of which 99,320.25 acres were in Lalitpur, 65,205 acres in Mehroni, 26,153.37 acres in Garautha, 18,101 acres in tehsil Jhansi, 18,096 acres in Moth and 10,993 acres in Mauranipur. It is, therefore, clear that the area under forest decreases from south to north. These forests are scattered; the densest

and the best being found in Vindhyan plateau and the undulating tract of Lalitpur and Mehroni sub-division. The timber trees are generally confined to the Vindhyan slopes, teak being found along the Betwa, the Dhasan and Jamni and salac on the hillocks, that are flat. The total area of the timber forest in Jhansi district in 1960-61 was 40,764 acres of which 27,548 acres were in Mehroni and 12,919 acres in Lalitpur.[23]

The area under timber trees being very poor, the forests of the districts are utilised mainly to meet local demand for firewood and the only forest industry is that of biri making for which the leaves of tendu trees are used. Other minor products of the forests are honey, wax and lac but their yield is negligible. The number of khair trees in the forests is sufficient but the yield of catechu is very poor.[24]

Area under forest land in different years is as follows :-[25]

Year	Forest area in hectare
1968-69	2,036
1972-73	1,828
1979-80	32,544

FOREST AREA IN JALAUN DISTRICT: The forest area in Jalaun is 26,503 which is 5.7 per cent of total area. Forest supply on few fuel. There is no production of building wood and bansc.[26]

Year	Forest area in hectare
1977-78	26,501
1978-79	26,908
1979-80	27,408
1980-81	27,568

FOREST AREA IN BANDA DISTRICT: According to the forest department the forest area of this district is 70,696 hectares out of which 67,000 ha. area include sub-division (Mau, Karvi) and remaining 4,000 ha. area include other sub-division. 5,000 ha. forest area is of building wood. The remaining area is of different types of trees and shrubs. In 1979-80 area under forest was 55,131 ha.[27]

FOREST AREA IN LALITPUR DISTRICT: The forest area in this district is 67.6 thousand ha. which is only 13 per cent of total area. In 1979-80 the forest area was 1,45,869 hectares.[28]

FOREST AREA IN HAMIRPUR DISTRICT: According to the finance development the area of forest was 30,393 ha. in 1974-75 which was 4.2% of the total area but according to the forest department in 1974-75 the forest area was 38,173 ha. Mostly fuel wood are found in these forests. In 1978-79 forest area was 32,229 hectare while in 1979-80 forest area was 32,328 hectares.[29]

6. SCOPE FOR FODDER CROP CULTIVATION: Bundelkhand like any other region of Uttar Pradesh possesses cattle wealth. Generally it is found that cattle of this region mostly live on grazing on vast open fields and they move out themselves for search of food. This practice discontinues during dry hot period from early April to middle of June till the outbreak of monsoon. It is only a matter of chance how many cattle survive and most of them lose their health and ultimately they bear burden to their owners. The hazardous life of cattle of Bundelkhand has a long history and local cultivators and their owners have fields to provide them necessary food for their existence. They have been either managing fodder supply from the site of

neighbouring areas or have been producing fodder scattered on a very limited scale. In fact fodder production has been completely neglected during the past and Bundelkhand cattle were surviving on the mercy of natural bounties. This was responsible for the poor stock of cattle and their migration to neighbouring areas. The cattle wealth have not been fully utilised on account of this neglect.

Bundelkhand region has a great scope for fodder cultivation and the area is ideally suited for the purpose. The region has been incurring losses on account of depending for fodder supply from outside the region. Unlimited harm had been done in this direction because the cattle owners were neglecting their cattle on this account. This is a great pity that the Bundelkhand area possesses surplus land and starving cattle. The time has gone when the cattle should search for their own food. If man expects all the benefit from cattle wealth, he is supposed to give and manage proper food for them and it becomes a social responsibility to maintain cattle health of the region. Bundelkhand region has all the infrastructure for providing proper food for

the cattle and as such fodder production should be developed without delay. The expansion on fodder production can well be shared by other crop productions which shall minimise expenditure on fodder production. If fodder production is to be developed separately, necessary provision should be made accordingly. It is necessary to harness and work out the fodder economy for the benefit of cattle population of the region. Fodder cultivation does not require any special inputs and its cultivation can be well spread out on almost all the region of agriculture production. There are many natural drains, lakes and ponds and also river banks areas and they can all be utilised for fodder cultivation and most of these areas are not under plough and are left over for some reason or the other. It is expected that fodder cultivation can be speeded up on such reclaimed area. The Bundelkhand cultivators have got to be accustomed to the production of the fodder cultivation.

CHAPTER I

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2. Census Report 1951

3.
4. Economic Glimpses of Jhansi
5.
6.

7. Rabi Plan for Bundelkhand (1974-75) p. 6

8. Rabi Plan for Bundelkhand (1974-75) p. 8

9. Statistical Report (1978-79)

10. ibid. (1978-79)

11. ibid. (1978-79)

12. Sixth Five Year Plan Hamirpur(1978-79)

13. ibid. Lalitpur(1978-79)

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16. Rabi Plan for Bundelkhand p. 5

17. Statistical Report (1978-79)

18. ibid.

19. ibid.

20. ibid.

21. ibid.

22. Gazetter

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24. Sixth Five Year Plan

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26. ibid. p. 33

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28. Sixth Five Year Plan p. 25

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CHAPTER II

FODDER CROPPING AND RESOURCE UTILISATION:

1. VARIETY OF SOIL AND ITS DISTRIBUTION:

The soil of the great northern dobs are derived from Himalayas by a long process of sedimentation and washings, but those of Bundelkhand are a class apart. Vindhyas are geologically different from Himalayas and the soils in the ears which lie to the south of Yamuna have been formed from the fragment of rocks brought down from the hills and ranges of Central India. The typical red soil is not water borne and is too poor in plant food and can not stand continuous cropping. There are other soils, deposited in course of time, by the action of water and they belong to the class of black soil country.

"The physiography, nature and development of soils of the region are remarkably different from the Indo Gangetic plain while the soils of the Indo-Gangetic plain are of alluvial origin, having developed alluviums of Ganga and Yamuna and their tributaries. The soils of Bundelkhand are mainly of residual origin owing their genesis to the Vindhyan

rock system traversing the region from west to east as part of extension of the main Vindhyan range of Central India. The soils are generally of shallow and medium depth and are underlind by undecomposed or partially disintegrated parent material. Broadly the soils of this region are divided into two main groups; one comprising the red soils and the other of black soils. From amongst two groups, three soil series have been recognised. These soil series in local parlance are known as Rankar, Parwa and Kabar including Mar. Description of each type is given below."[1]

BUNDELKHAND TYPE-I RANKER: This represents coarse grained soils of reddish brown colour with a thin layer of good soil on the top. In general appearance this soil looks like eroded soils and the parent rock can be met within 4 to 5 feet of the soil. They are predominantly sandy in texture having about 35% finer fraction of slit and clay together. This type has further been divided into two sub-types called Bundelkhand type IA, as the soils of rocky ridges and Bundelkhand type IB coarse grained reddish soils."[2]

BUNDELKHAND TYPE-II, PARWA SOIL: These are greater in depth as compared to Bundelkhand type-I. Most important feature is the presence of a zone of calcium carbonate accumulated in the

form of 'kankar' layer at the bottom. It is light coloured soil resembling the loam, considerably in fertility and yields of crops. The soil is brownish having loamy texture and a slightly acidic pH. This class has also been divided further into two types depending upon surface colour, namely Bundelkhand type 2A brownish loam soils and 2B grey loam soils. It is the best type of the soil in Bundelkhand for growing crops of high marked value."[3]

<u>BUNDELKHAND TYPE-III, KABAR SOIL</u>: The soil is black in colour and clayey. These exhibit considerable depths and are developed inside with the parent rock standing below. The soil is calcarious in nature varying from 7 to 9.0 in respect of pH. These soils swell with rain water and contract when it dries, developing small fissures.

<u>MAR SOILS</u>: These soils are black coloured and have a very fine texture. The property of swelling when wet and contracting on drying is exhibited to a marked extent. Owing to this property these soils crack on drying developing large and sometimes very wide fissures as compared to Kabar soils. Kabar rodules are found in large numbers at lower depths. These soils can be tilled only under conditions of optimum moisture and as such are utilised mostly for Rabi crops."[4]

OTHER SOILS: Local people have their own names for some particular classes of soils although the latter are derived from the four principal varieties mentioned above. For instance 'Dang' signifies jungle land, 'Bhato' is the name given to unculturable areas, 'Kirra' is low lying and is reserved for rice cultivation and 'Khero' is the land specially fertilised by manuring and irrigated land which is fenced for protection is known by the name of 'Tereta'. 'Tari' is the name given to the land which lies below the tanks or in the beds of dry tanks."[5]

SOILS IN JHANSI: There are mainly four types of soils :-

(1) Mar

(2) Parwa

(3) Rankar

(4) Kabar

MAR: It is dark black in colour and by a little amount of water it becomes slac y. It has capacity to retain water. On the upper layer 23% - 45% clay contents are found. On the layer surface lime is in large quantity. It is better for wheat, jowar, peabean, gram and cotton.

PARWA: It is brownish yellow and found on the banks of Betwa and Dhasan. The moisture is lesser than Mar.

KABAR: It is mixture of Mar and Parwa. The clay contents is 40% - 50% and lime is 10%. It requires more irrigation than Mar. It is better for wheat, gram, maize, peabean, jowar, linseed.

RANKAR: It contains 6% - 30% clay and 20% lime. It absorbs large quantity of water. Wheat, jowar, maize etc. are grown in this soil."[6]

SOILS IN JALAUN DISTRICT: There are also four types of soils in Jalaun. They are Mar, Rankar, Kabar and Parwa.

MAR: Owing to the large absorbing capacity, it is more productive and found in the middle part of the district which is 30% of the total area.

RANKAR: It contains large quantity of dust. It is found near the rivers at 4 kms. It is no more productive. So, it is suitable only for Jowar, bajra, moong and urad. It is found on area which is 13% of total area.

PARWA: Parwa is found near the rivers in the north part."[7]

SOILS IN BANDA: The types of soils found in Banda are as under:-

MAR: It is dark black and more productive. It is calcarious soil and better for mixture of wheat and gram. In rains it

absorbs more water. Therefore, there is difficulty in ploughing.

<u>KABAR</u>: It is also black soil but hard than Mar. After rainy season it becomes dry. So, there occurs difficulty in ploughing.

<u>PARWA</u>: It is yellow in colour and requires more water. It is found in large quantity. With the help of fertilizer and irrigation many crops can be grown in this soil.

It is very hard soil and useful only for jowar and bajra."[8]

<u>SOILS IN HAMIRPUR</u>: There are also four types of soils. The area under different types of soil is given below:-[9]

Soil	Area in hectares
Mar	1,35,762
Kabar	1,29,056
Rankar	2,24,390
Parwa	1,68,875

<u>SOILS IN LALITPUR</u>: In this district mostly Rankar and Parwa soils are found. Rankar is mostly found in Talbehat and Jakhora and Parwa is found is Bar sub-part. It is a hilly area.[10]

2. FOOD FOR SOIL AND THEIR AVAILABILITY:

Food is very necessary for the survival of human being and live stock. Similarly plants also take their food in different forms for their growth. There are different types of soils in Bundelkhand region and requirement of food is also different. The main elements of food are water, air and organic matter.

Air is absorbed by atmosphere and water from ground or from rainfall or other natural resources. Some space always exists inside each soil granule. These spaces are filled with rainy water and air. A soil in good condition for plant growth will have half of the pore spaces filled with water and the other half filled with air. Some of the rain water enters the soil and is known as soil water. Some of the water is present as hygroscopic water. This water is held very tightly by the soil particles and it is not available to plant. Some portion of water is absorbed by capillary and known as capillary water which is available for plant growth. Water that moves downwards in the soil is known as gravitational water.

Air is absorbed by stomata which are found on the surface of leaf and passes through grass tissue into the root

and absorbed by soil. The soil air consists of some gases as that of the atmosphere, but soil air consists more Co2, more water vapour and less oxygen.

ORGANIC MATTER: "All soils contain organic matter in large or small amounts. Fertility of soil depends upon the quantity of organic matter. The main source of organic matter is plant residues although animal residues also contribute some organic matter to the soils.

Plant residues consists primarily of lignins, oils, starch, sugar, cellulose and proteins. Under favourable conditions of moisture and temperature, plant residues are attacked by micro organism and decomposition takes place until humus is formed (Humus is organic matter that is resistant to further decomposition).

Organic matter influences the physical, chemical and biological properties of the soil. Without organic matter the soil would be a dead mass since there would not be any activity of the micro-organism. Organic matter supplies food for almost all micro-organism and for this reason organic matter is called the life of the soil. Organic matter improves soil structure, increases the water holding capacity of sandy

soil and increases the poracity of clay soils. Organic matter also imparts a dark colour to the soil.

Organic matter is the main storehouse of nitrogen. Small quantity of all plant nutrient are also supplied when organic matter decomposes.

As soon as a grassland or a forest is ploughed, the decomposition of organic matter is hastened. With continuous tillage the percentage of organic matter continues to decrease until an equilibrium between the addition through crop residues and decomposition is reached."[11]

3. PRIMITIVE METHODS OF SOIL NUTRITION & CONSERVATION:

The main nutrients of soil is organic matter which contains all the 18 elements for yield. The main source of soil organic matter is plant residues and animal residues. Under favourable conditions of moisture and temperature residues are decomposed in humus. Organic matter influences the physical, chemical and biological properties of the soil. Without it the soil is a dead mass. All organic matter originally come from plants, animals eat some of these plants and in turn their dead bodies supply organic matter to the soil. In nature, plant materials which supply most soil

organic matter include forest tree leaves, twigs and the remains of dead grasses. Under yield conditions, manure crop residues, green manure crops, compost and many waste products contribute mainly to replenishing of valuable soil organic matter.

Unless there is a sufficient amount of fresh, active organic matter in the soil, the soil can not be very productive.

In a virgin soil there is a large amount of organic matter due to its constant accumulation from residues of natural vegetation as well as from animals. As soon as soil is brought under the plough accumulation stops because the natural vegetation is destroyed and decomposition is hastened. Thus, organic matter is depleted very rapidly.

The methods of increase in the amount of organic matter are given as follows:-

1. ADOPTING A SATISFACTORY LAND USE PROGRAMME:

In this method specially quick growing forage legumes help in adding organic matter and nitrogen to the soil. The small origin crop such as wheat does not deplete the soil of organic matter. The inter cultivated crops such as cotton, maize and jowar hasten organic decomposition.

In this method all of the plant residues should remain in the soil and not be removed for use as fuel.

2. APPLICATION ON FARMYARD MANURE:

Farmyard manure is a by-product consisting of drug, urine and straw.

On the contrary the nutrients present in urine are quite readily available, either directly or after simple decomposition. Drug consists of about 50% of the nitrogen, 15% of potash and almost all of the phosphorous that is excreted by the animal. The quantity added varies from one half pound to eight pounds per animal per day. The method of handling manure can be improved by the use of the pit or the heap method of storage.

THE PIT METHOD: In this method straw is kept on the floor of the pit as an absorbent layer. After collecting all of the manure and bedding it should be well mixed so that every piece of straw comes in contact with dung and urine to facilitate better decomposition of the material.

The material should be arranged layer by layer. Each day layer is formed about one foot deep until the pit is filled then a four inch layer of soil or stone is put on

the top. Each day layer should be pressed down and covered with a layer of soil about one half inch deep. Rain water should be allowed to enter the pit.

THE HEAP METHOD: The heaps are prepared above ground and manure yard situated on a high line site. Each day's material is arranged layer by layer. When the heap is about six feet high it is rounded on the top and plastered over with mud. The manure is ready for use after about four to five months.

COMST METHOD: In thousands of Indian villages and towns the problem of disposal of human excrete is great. If the night soil is trenched in deep pits it may take a year for the material to dry and be ready for use. Material that can be added to the soil to increase soil productivity consists of any plant refuse and the excrete of animals and human beings. The farmers use some of the plant residues and excrete of the farm animals for preparing farmyard manure and compost.

Most refuse can be added to the soil directly and experiments have shown that it is quite beneficial to do so. But, it is not very practical to add fresh refuse to the soil because of possibility of harmful effects on the crops that follow.

For making good compost the following conditions

should exist.

(a) MOISTURE: There should be sufficient moisture for development of micro-organism. The material should not be too dry or saturated with moisture.

(b) TEMPERATURE: Too low a temperature or too high a temperature is not conducted for proper growth of micro-organism. In India the shade of a tree may be best temperature.

(c) NUTRIENTS: The micro-organism functions only when sufficient quantity of essential plant nutrients are available. Nutrients requirement is same as crop plants.

(d) STARTER MATERIAL: The proper types of micro-organism should exist in the heap and, therefore, old compost or farmyard manure should be added to the new compost pile to hasten decomposition.[12]

SOIL CONSERVATION: Conservation of natural resources and their proper use is the fundamental problem of national life. The resources are inexhaustible and so the reward for foresight is great and can be foretold. There must be a realisation of the fact that to waste and to destroy the natural res ources or to exhaust the usefulness of the land will result in undermining ultimate prosperity.

The washing of soil by rain is dangerous of all

wastes. It is easily preventable by raising small obstruction on the sides of field or by contour bundhies and should widely be adopted in Bundelkhand to stop this enormous loss of fertility.

Preservation and replacement of forests are other methods of conservation. The present annual consumption of timber and fuel in Bundelkhand is three times as great as the growth, if consumption and growth continue unchanged. Practically all the forests wealth may get exhausted in the time of a generation. Such a catastrophe can be avoided by embarking on large scale plantations in forests waste lands and otherwise incidentally conserve the soils.[13]

Conservation stands for the preservation of waste and for the development of natural resources. Furthermore the natural resources should be preserved for the benefit of the people and not merely for the benefit of a few.

SOIL CONSERVATION IN DIFFERENT DISTRICTS:

JHANSI: The land of Jhansi is very slopy because it is connected with the hills of Vindhyachal. Owing to its slopy character water flows fast so there is problem of soil conservation. Water is connected in lower land, thus there is formation of water reservoir.

For solving this problem in 1957-58 the work of soil conservation was started.

3,95,000 ha area of this district was under conservation. In 1973-74 work was done for this problem. In 1978-79 there was target of retaining of problem of an 1000 ha area.

There is second problem of agricultural excess water reservoir area. In 1973-74 work was done on 27,737 ha for soil conservation. From 19.4.74 to 1977-78, 5466 ha extra area was conserved. Thus upto the end of 1977-78 23,203 ha land was conserved. There was target of conservation of 1000 ha extra land in 1979-80.[14]

JALAUN: In this district about 2,55,000 ha area is affected by the problem of soil conservation. Soil conservation work is carried on by Agriculture department and Forest department. Units of soil conservation problem are found in Orai, Konch and Jalaun.[15]

In 1978-79 5,556 agricultural lands and 480 ha ravine land was under conservation while 1979-80 3,862 ha agricultural lands and 950 ha ravine land was under soil conservation.

<u>LALITPUR</u>: It is a hilly, rocky area. Owing to this there is problem of water collection. Owing to the slopy character of land and presence of rivers and nalas, the flow of water is very fast, so there is destruction of land.

Two units of soil conservation are present in Lalitpur and Mehroni. By these units 33,000 hectares of land was conserved in 1973-75 and 31 water harvesting bundhies were made.

Two units are not sufficient to solve this problem. So, district is divided into following water reservoir area:-

(a) Dhasan, Jamini and Rahini water reservoir area.

(b) Water reservoir area on the west of Betwa and west of Shahjad.

(c) East of Shahjad and west of Sajnaum and Jamini river.

(d) Area of east of Betwa and west of Shahjad. [16]

<u>HAMIRPUR</u>: Soil conservation is a great problem of this district which is due to the presence of Yamuna, Betwa, Dhasan, Ken, Virma and many nalas. This problem is increasing gradually. In 1963 soil conservation units were established in this district.

BANDA: Mau and Karvi are very rough areas of this district. Owing to the presence of the Yamuna, the Ken, the Banga and the Chandravali rivers and nalas there is decreasement in capacity of fertilizing power. For increasing this capacity conservation of water is necessary.

For solving this problem two units in sub-division I (Karvi and Mauranipur) were present and three units in the sub-division II have been established.[18]

In this district 4,04,580 ha area is suffered by this problem. In the Fourth Five Year Plan 79,257 hectares were conserved.

4. ECONOMY OF FODDER CROP ROTATION IN RELATION TO CASH CROPS

The development of fodder crops in the region should be in accordance with other crops. Their timing should be such as to avoid clash of rotation. Agriculture production in Bundelkhand generally depends on local water resources on account of its dry climate and insufficient rainfall. Even if the productivity factor agricultural land of Bundelkhand is constant then the water for irrigation purposes is managed in such a way so as to feed Rabi and Kharif crops with limited water supply in the region. It is important to note

that major crops of the region should not be disturbed but at the same time other subsidiary crops must come up for the balance of economy of the region. Fodder cropping is one of those subsidiary crops cultivation which requires great attention. The cattle health of the region depends on stable fodder cultivation. The purpose is to initiate fodder cropping in order to meet the fodder requirement of the region. The output of major crops should not define in any way and fodder production should be made such so as to provide necessary food to the cattle of the region. The production should not be confined in relation to demand, even surplus production should be worked out, if possible. The cost of fodder should not be high and should be within the reach of the cattle owners. Bundelkhand region is gifted with ample land and it should not be difficult to regulate fodder production in relation to cash crops. The fertility factor of land should be considered and proper inputs like fertilizer should be used according to the requirements. The total cropping period of the year should be carefully divided in between subsidiary cropping and major crop production.

There is no question of any clash in between but efficient crop management will eliminate the risk of

shortfall. The economy of fodder production should be worked out in such a way so as to give amplitude in all the directions of agriculture production.

The cultivator of Bundelkhand will have to get himself accustomed for fodder cultivation. Proper incentives are to be provided to make him realise to develope the fodder production as a subsidiary occupation in the field of agriculture. It has been found that there had been no well organised system of fodder production in different areas of Bundelkhand. The local cultivators are rather ignorant and show apathy for fodder cultivation.

The development of fodder cultivation can be gradual once the local cultivators realise about future fodder marketability then they will be inclined to produce fodder on commercial lines. In this way economy of fodder production will be geared up for which Bundelkhand is very well suited. This will not be in any way detrimental for the production of cash crops and other subsidiary crops in the region. In some cases certain surplus land can be earmarked for fodder production only. The cycle of crop carefully planned in order to obtain maximum benefit. Once the economy of fodder production is geared up it will function automatically in

future, similar to the major crop production.

5. FERTILIZER AND THEIR SUPPLY:

In the modern technology fertilizer has become a must but it is unfortunate that our resources are rather meagre.

Fertilizer application has shown recently an upward trend and it has become very popular among cultivators. This popularity has been a result of method and demonstrations planned and executed successfully on cultivators' fields. The effect of distributing large scale fertilizers in balanced dose has also made a dent in traditionally old practices of farmers and making them fertilizer minded.

Out of the 18 elements needed for proper plant growth, Nitrogen, Phosphorous and Potash are the most essential. Life without nitrogen is not conceivable. It exists right from chlorophyll to blood plasma. It is vitally important for plant growth and food production and as such has to be applied in the fields in proper doses. Phosphorous occupies the central position in plant development, seed production and controls the physiography as a whole. The role of Potash is very important and essential. It is a fact that the fields

applied with the full dose of fertilizer has been found healthy and disease-free. Perhaps it imparts some controlling factors for the development of plant systems whereby a better synthesis of proteins, carbohydrates etc. take place which in turn gives a bold and luster on the grains and increases yield. Bundelkhand soils are incidentally deficient in phosphorous and potash also as per soil testing results conducted in a large number in this zone. The majority of the samples have shown low available phophatic and low to medium. Thus, balanced fertilizer application in Bundelkhand region is very essential for increasing food production.

Extensive propaganda conducted by the Agriculture Department through Block agencies has broken the old tradition and now the cultivators have started using the nitrogenous and phosphatic fertilizers. Some progressive cultivators are using potashic fertilizers in addition to zinc.

Bundelkhand has got typical soils quite different from other regions, which pose a difficult problem for the use of fertilizers. Half dose nitrogenous fertilizers application with full dose of phosphorous and potash as

Statement showing the fertilizer distribution in Bundelkhand region in terms of Nitrogen, Phosphorous and Potash

Year	JHANSI			JALAUN			HAMIRPUR			BANDA			LALITPUR		
	Nit.	Phos.	Pot.	Nit.	Phos.	Pot.	Nit.	Phos.	Pot.	Nit.	Phos.	Pot.	Nit.	Phos.	Pot.
1961-62	208	80	..	213	74	..	48	11	..	120	..	..	Not applicable		
1962-63	194	45	..	301	73	..	87	20	..	150	..	..	do		
1963-64	327	68	..	428	75	..	319	67	..	375	..	..	do		
1964-65	400	65	..	435	66	..	48	11	..	638	112	..	do		
1965-66	327	60	..	779	126	..	57	20	..	403	168	..	do		
1966-67	274	79	11	771	194	73	319	67	..	348	97	35	do		
1967-68	601	265	136	1435	543	76	466	145	..	316	134	37	do		
1968-69	576	262	165	1729	682	135	372	59	..	465	287	101	do		
1969-70	1136	475	121	7621	1029	216	198	58	9	662	326	133	do		
1970-71	1029	326	228	2367	987	246	500	135	42	674	356	169	do		
1971-72	1952	554	261	3001	859	251	415	225	37	1035	434	188	do		
1972-73	1919	1002	354	2535	1344	310	523	252	56	1249	623	154	do		
1973-74	1370	701	131	2254	324	169	706	..	..	1232	553	153	do		
1974-75 to 1978-79	Data not available														
1979-80	3119	1899	454	1540	710	150	261	1232	21	..	..	..	Not available		
1980-81	1500	900	200	1020	750	90	2200	1200	600	2600	1480	400	1500	1200	300

basal dose has been recommended. But in case of top dressing, split dose has been recommended because most of the fertilizers are bleached or even in the soils.

Use of folior spray has become quite popular among cultivators. They use this in pure urea solution or mixed with pesticides in effort to save the crop and rejuvenate it at an early time.

From the figures of fertilizer distribution given herein it will be observed that cultivators are becoming fertilizer minded. Now a difficulty has arisen due to the limitation of non-availability of fertilizers in this region owing to the shortage in the country. The bulk of fertilizers has been sold to the cultivators by the agriculture department, the co-operative comes next, followed by Agro and other agencies. The agriculture department has got 116 seed stores to cater the needs of fertilizers. The co-operative department has got 153 sale points and 95 seed stores while the Agro has got four and number of licensees. There is no Cane Department in Bundelkhand region. The share of Cane department has also to be supplied by agriculture department.

At present the total Nitrogen, Phosphorous and Potash is 1,500, 400 and 400 metric tonnes, respectively,

which is very insufficient for Rabi season. Thus, the cultivators will have lesser doses of fertilizer to apply while the food production target has been raised to 13.57 lakh tonnes against an achievement of 12.37 lakh tonnes in 1972-73.

Bundelkhand region being a surplus food zone can easily produce the target quantity of food provided the above quantity of fertilizers can be made available to this region. But unfortunately it may not be possible under the present conditions. The strategy again will have to be changed as follows:-

(a) Cultivators will be requested through pamphlets, press and radio that they should use compost, cowdung, night soil etc. in their fields.

(b) There should be no broadcasting of fertilizers but it should be sown in a band placement behind the plough at the time of sowing.

(c) Split doses of fertilizers should be used as top dressing, depending upon the crop cut conditions.

(d) Folior spray may be resorted in large number to increase production.

(e) Use of potash as a folior spray has been found suitable in some demonstrations and will be popularised in this region.

(f) There is no doubt that fertilizer application in irrigated area is a must in HUP programme and food production, but it is needless to say that some dose of fertilizer say 2 kgs. per hectare used in irrigated area may give a much better return in those areas and may ultimately increase food production. In Bundelkhand where unirrigated area is 78.81%, while irrigated area is about 22%. This strategy may also yield dividend this year."

6. RESOURCES UTILISATION MEASURES:

Natural resources of a region are its arable and other lands, the rivers, the mountains and the hills, the forests and the minerals. Their existence depends on the

topographic and geological conditions. It is their abundance which constitutes the wealth of a region. The volume of available resources per capita and their economic exploitation determine the economic level and the standard of living of the people residing there.

Economic development of an area is not merely related to the availability of natural resources and their geographical locations but is chiefly concerned with the goal which inspire and move the people to what they do with land, labour and capital and to the way in which they organize themselves. It is in this context that the natural resources of Bundelkhand are being examined now.

The grass area of Bundelkhand districts is 7.45 millions, its population is 29 lakhs which is equivalent to a density of 4.4 per square mile and is much less than the density for U.P. This shows that Bundelkhand has more land per head and good scope for land development. The area is divided as

Foresta	...	3,63,562 acres
Wasteland	...	973 acres
Arable land	...	61,13,259 acres
Gross area	...	74,50,309 acres

Natural resources of the Bundelkhand region are given below :-

<u>LAND</u>: In this region mostly three types of soils i.e. Mar, Parwa and Kabar are found. In Jhansi Parwa is found mainly on the Kachchar of Dhasan and Betwa river. Rankar soil is found in Sub-division II (Baragaon, Babina and Bangra).

On the basis of natural resources Banda district is divided into two sub-parts :-

(1) Rocky Ratha area

(2) Plan area

In Rocky Patha area Parwa and Rankar soils are found. In this area mostly hilly rocks are found. There is also deficiency of nitrogen on this type of land. In sub-part II Mar, Kabar and Parwa soils are found. Mar and Kabar are very productive. In Hamirpur and Lalitpur mostly four types of soils viz., Mar, Kabar, Rankar and Parwa are found. Lalitpur is a rocky area. In sub-part I mostly Rankar and Parwa are found. Rankar soil is found in Talbehat and Jakhora. Parwa is found in Bar sub-part II is a hilly area where Mar, Kabar and Rankar soils are found.

Land utility in 1979-80 in Bundelkhand region is given below :-

	Jhansi	Jalaun	Hamirpur	Lalitpur	Banda
1) Total area	5,027	459,164	71,926	5,135	76,450
2) Forests	32,544	26,501	32,328	66,995	85,563
3) Agricultural wasteland	75,368	12,284	41,818	14,586	55,131
4) Land utilised for other purposes	31,521	25,360	41,746	425,517	35,539
5) Grassland	976	333	496	7,618	58
6) Parti land	34,754	27,402	34,754	57,191	62,996
7) Net sown	..	347,203	..	183,710	499,707
8) Area sown more than 2nd time	23,584	24,121	29,194	..	..
9) Total area sown	326,591	371,394	32,659	..	..
10) Not irrigated area	..	63,976	..	..	137,614
11) Total irrigated area	6,079	67,303	..	..	1,376

WATER: Normal rainfall of this region is 925.6 mm. per year but it changes every year. The main resources of water are rivers, ponds, tanks, canals and tube-wells. In Jhansi main rivers are Dhasan, and Betwa. On Betwa Sukban Dhukban and

Parichha, two large dams are formed. On Dhasan Pahari and Lahchura dam and on Sukhsari river in Mau, Kamla Sagur dam is made.

In Hamirpur there are many rivers but due to the shortage of dams there is no right utilisation of water.

Main rivers are the Yamuna, the Betwa, the Dhasan, the Ken and the Urmil. But the Dhasan is used only for irrigation.

Lalitpur is a slopy area so the water of Betwa, Jamini, Sajnam, Rohini and Jamdar flow fast to the lower city. Betwa is the biggest river on which Matatila and Sukban and Dhukban dams are formed. On Jamini river, Jamni dam is formed.

In Banda irrigation is done mostly by Ken river. Main rivers are the Yamuna, the Ken, the Banga and the Payswani. In part I rainy water is insufficient. Therefore, bundhies are formed for irrigation.

UNDERGROUND WATER: The study of underground water resources was greatly neglected in the past. It was idifficult to estimate previously the water reserve in their availability inside the ground strata. So, it became necessary to study

and survey ground water resources. This ground water management is a specialised technology for maintaining the productivity of land. If water resources on land are important for cultivation, similarly under ground water is equally important for the land productivity. In order to have optimum agricultural production it is necessary to balance water resources on land with that of under ground water resources. This will maintain the fertility of the soil and avoid water saturation. The State Government has recently taken up intensive survey and study of under ground water resources in Bundelkhand region. The purpose is to regulate irrigation facilities in accordance with availability of water not only above the ground but also under the ground. The rainfall and the local landscape directs under ground water resources and it is necessary that under ground water resources should be well considered in case the above ground water resources are in short supply. There is surely more consistency in under ground water resources which are natural while the above ground water resources are partly natural and partly man made. Bundelkhand is well gifted in natural resources. Only technology is lacking behind in this region. The factor is

equally responsible in the production of fodder crops of the region. Specific descipline in relation to fodder production should be followed rightly. State Government and also the Central Government are laying great emphasis on the technology of irrigation. Under ground water resources have to play a major role in the development of agriculture production as a whole. State Government has created a separate under ground water resources department for thorough investigation and research. Different engineering colleges and universaties have bëen opened. Under ground water resources centres have to undertake study for this specialised branch of detrimental production of cash crops and other subsidiary crops in the region. In some cases certain surplus land can be earmarked for fodder production only. The cycle of crop rotation should have to be carefully planned in order to obtain maximum benefit. Once the economy of fodder production is geared up, it will function automatically in future similar to major crop production.

FORESTS: Forests play an important function in protecting soil from erosion. Forests stop cracking of soils to make atmosphere according to the agriculture, to control the flow of over rainfall. Forests are the source for several kinds

of timber which meet the requirements of building industries. Forests meet the growing demand of urban firewood and timber required for rural housing.

In Bundelkhand region forests occupy 3,64,000 lakhs acres of land which is hardly 50% of the total area.

The area under forest in Jhansi, Jalaun, Hamirpur, Lalitpur and Banda is 32,544, 26,501, 32,328, 66,995 and 85,563 hectares per km. respectively.

MINERALS: Minerals are natural resources which are very important for many purposes. Bundelkhand region is a rocky area. Therefore, mostly stone and dust are found.

In Jalaun and Jhansi districts, moorum, sand and crushed stones are found. Hills are also found in Jalaun and Jhansi but stone of these hills is not good. Banda district is rich of minerals. Granite, building stone, silica dust, lime stone, geru and boxite ore found. On the bank of Ken semi transparent stone is found which is used in button, paper weight and finger ring stone.

In Hamirpur building stone, paraphylite and uranium are found in large quantities.

LIVE-STOCK: Animals play a very important role in people's

economy. Bullock carts are used in sending the agricultural products from farmers to the market. Livestock is the wealth of nations on which people depend directly or indirectly. Bundelkhand contains a large number of livestock. Bundelkhand agriculture can not be developed without the best livestock. So, the development of cattle is very important. From the ancient times the animal husbandry is related to economic status of the village area and the farmers, but the animal lovers of Bundelkhand are still neglected by comparative profit of districts because here milk producing capacity is very less. The main reason of less production of milk is rocky area, less irrigation facilities. In Bundelkhand region the condition of livestock is very pitiable.

The keeping of cattle is a good business for rural people who have no more land and can not earn money by other means.

The milching cattle give many products to the vegetarian people. The main products are milk, meat, bones, skin and dung. Calves are used in ploughing. Dung and anumal residues are used for farmyard manure.

7. IRRIGATION POTENTIAL AND WATER MANAGEMENT:

Irrigation plays a role of varying importance in the different parts of the region, depending on the nature of the soil. In the region of the black soil irrigation is not absolutely necessary because of the moisture retaining nature of the soil, good harvest being raised even in years when the rainfall is not abundant but it is necessary in red soil tract which are less absorbent of moisture.

The geographical area of Bundelkhand is 29.95 lacs hectares out of which 4.07 lacs hectares area is irrigated. Ther percentage of irrigated area is worked out to 2.2.

Irrigated area of different districts and the percentage of irrigated area out of total croped area is as below:-

District	Irrigated area	Percentage
Jhansi	1,08,218	20.27
Jalaun	1,38,306	36.22
Hamirpur	82,168	15.73
Banda	1,00,531	17.12
Lalitpur	42,719	8.12

Details of irrigated area in Kharif, Rabi and Zaid is given below:-

S.No.	Districts	Area irrigated (Hectares)			
		Kharif	Rabi	Zaid	Total
1.	Lalitpur	808	41,331	580	42,719
2.	Jhansi	2,434	62,126	869	65,499
3.	Jalaun	9,366	1,28,776	164	1,38,306
4.	Hamirpur	3,080	78,509	279	82,168
5.	Banda	71,033	29,434	64	1,00,551
	Total	86,721	3,40,546	1,956	4,29,223

Irrigation department has proposed the construction of Rajghat, Rohini and Shahjad dams in Lalitpur districts under intensification of Betwa canal system and has also proposed Urmil and Maudaha dams in Hamirpur district in Five Year Plan. On the completion of these projects the irrigation potential would increase sufficiently by the end of Sixth Plan.

IRRIGATION POTENTIAL AND RESOURCES OF IRRIGATION OF JHANSI, JALAUN, HAMIRPUR AND BANDA.

The low water table and the hilly topography of Jhansi district have always been an obstacle in the expansion of irrigation and in consequent the irrigated area

has always been insignificant.

Canals, rivers, lakes, tanks, pumping set, tubewell are the main sources of irrigation in the Bundelkhand region. Bundelkhand has rivers and streams of all sizes but they are not snow fed. They swell in the monsoon and vanish in the hot weather. For the most part they traverse through rocky bed and have numerous suitable sites for storage reservoirs which furnish the potential for irrigation.

Principal rivers which may benefit Jhansi and Jalaun are Betwa, the Dhasan, the Pahuj and the Jamani. Those for Hamirpur are the Dhasan, the Arjan, the Chandrawal and the Sihau and those for Banda are the Ken, the Bhagain and the Paisuni.

Masonary wells have always been an important source of irrigation in region though in the last 15 years due to the expa nsion of canal system which now irrigates almost the same area as is irrigated by wells. Tanks and reservoirs are also a source of irrigation but the irrigation is done mostly by means of canals. The number of tubewells is very little.

The area irrigated by these sources in different districts is given below :-

Source of Irrigation	Irrigated area in hectares				
	Jhansi 1978-79	Jalaun 1978-79	Hamirpur 1978-79	Lalitpur 1978-79	Banda 1978-79
1. Canals	64,562	1,47,590	908	..	..
2. Governmental tubewell	..	15,120	140	..	..
3. Private tubewell	376	1,640	399	..	..
4. Pumping set		4,948	4,888	2,404	..
5. Well	20,348	8,608	12,887	28,383	..
6. Rahat		482	482	..	..
7. Tanks	96	499	46	..	..
8. Bundhies	331	84,446	5,893	763	

TYPES OF IRRIGATION: There are three types of irrigation:-

(1) Minor irrigation.

(2) Major irrigation.

(3) Medium irrigation.

MINOR IRRIGATION: The Minor irrigation programme is popular in all the districts of the region, but tubewells are localised in the area where strata is found to be favourable as in Jalaun and Hamirpur districts.

MAJOR AND MEDIUM IRRIGATION: The construction of dams for storage of surplus river flow was constructed as early as 1886 when Parichha weir was constructed on Betwa river as a draught relief work and another reservoir was constructed across the river in 1919 at Dukvan. The Matatila dam was constructed on Betwa which was completed in 1958-59.

ECONOMIES OF IRRIGATION FROM BUNDHIES: A common method of irrigation in Bundelkhand is by the construction of contour bundhies. There are small bunds raised a few feet above ground to collect rain water which keeps the soil wet until the Rabi sowing season. Water is then let out and crops sown. The cost is Rs.50/- to Rs.300/- per acre. It has been practical. The disadvantage is that only one crop may be grown. Howsoever uneconomical, bundhies provide security

for atleast one crop in the year against draught. The average cost of providing irrigation by means of contour bundhies varies according to the gradients of the country.

ECONOMIES OF IRRIGATION FROM OPEN WELL:

Open wells are the most popular and easy method of providing irrigation in Uttar Pradesh, but Bundelkhand sub-strata and spring level are not suitable for wells. The cost of an ordinary masonary well in other parts of Uttar Pradesh is about Rs.300/- and irrigated therefrom is 5 acres, cost per acre benefitted is Rs.300/-. In Bundelkhand a similar well costs about Rs.1000/- and so the cost per acre benefitted is too high and utterly uneconomical.

WATER MANAGEMENT: Water management is often equated with irrigation. Water management includes irrigation but it must be considered in a much borader context. Water management begins at the time when rains or snow starts falling and continues till it is efficiently used by growing plants. Depending upon the situation, water management may involve water shed, conservation practices, water harvesting storage, conveyance and application, undergrown storage, pumping utilisation and recharge surface or sub-surface drainage of

excess water or a combination of any of these facts.

Agriculture is inherently the most inefficient industry for the use of stored water. In industry one ton water can produce a ton of processed goods but in agriculture a few thousand tons water will be required for producing one ton of food.

Consequently not only production per unit of water applied is low but it has created serious problems of water-logging and salinity in certain region. Thus water management has been found to be a specific and site oriented science.

AREAS OF WATER MANAGEMENT: Adequate and timely water supply is one of the basic inputs for obtaining potential crop fields Water differs from other plant nutrients in the following respects:-

(a) Water is required in large quantities.

(b) Water cannot be supplied in single stroke.

(c) Water effects crop yields not only directly but also indirectly by influencing the agronomic techniques of crop production.

CHAPTER II

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CHAPTER III

FODDER CROPS IN BUNDELKHAND

The term forage crops denotes plants used for feeding domestic animals that are reared on farm, namely cattle, buffaloes, horses, sheep goats, pigs and poultry. The term includes wild as well as cultivated plants that are used as stock and as stock feed. Domestic animals are either allowed to roam about and graze for themselves or fed with cut grass in stalls. The term grass in context of feeding live-stock and grassland agriculture is not limited to the narrow botanical sense alone but also includes the common associates of the legum family, soiling crops are green forage crops that are cut and fed in fresh condition to the stock. [1]

The live-stock population in Bundelkhand is high but the average milk production is very low. The main reason is that only a small percentage of total cultivated

area is used for grazing and most of the cattle have some grazing available only during the monsoon season. But for the remaining part of the year owing to the inadequate grazing they have to subsist on such materials as rice, jowar, kadbi, bajra, wheat and barley bhusa.

Obviously there is a shortage of fodder supply for cattle throughout the major portion of the year. The land under forage gives low outturn.

The common grazing land of villages is infested with weeds and the competing grasses are of very low nutritive value.

According to the season of the growth of crops the fodder crops of Bundelkhand may be listed as below :-

(1) Kharif fodder

(2) Rabi fodder

KHARIF FODDER: The common kharif fodders are jowar, bajra, maize, cowpea, guar, makchari and minor cultivated fodder.[2]

JOWAR: It is the most important cereal crop of the Bundelkhand region. It has been in cultivation since very ancient time in all the regions where rainfall is low and

uncertain. The growing of the jowar depends on soil and climatic conditions.

Owing to its tallness it is also known as sorghum. The name of the sorghum is derived from Italian Sargo, meaning rising above. It is also known as great millets because it is largest as well as most important amongst the group of cereal known as millets.[3]

CLIMATE AND SOIL: It is tropical in origin. It is a crop that thrives at temperature that ranges between 25°C and 30°C. It is not suited to high temperature nor below 15°C. It can grow under both dry and irrigated conditions. It is better suited to the heavier soils than light soils, although it is capable of growth on almost any red, black, heavy or light soils. It is unable to grow on every sandy soil. If the facilities of irrigation are available, jowar can be grown in all months of the year, although as a matter of fact it is grown in the season of March April. It gives best stand when humidity is high. No degree of summer heat is intense for jowar. So it can be grown under both irrigated and unirrigated conditions. In Bundelkhand it grows nearly under 1.35 cm. of rainfall.

Jowar under irrigated conditions in alluvial soil gives high outturn. It is a highly fertile exhausting crop. For a good yield it requires well drained soil condition and the growth suffers from water logging.

VARIETIES: Although varieties of jowar are very numerous yet the following varieties are common in the Bundelkhand region.

(1) M.P.Chari

(2) Pusachari

(3) Sweet Sudan

In Jhansi district the following varieties of jowar are common :-

(1) C.S.H1

(2) C.S.H2

(3) C.S.H3

CULTURAL PRACTICES: Fodder jowar is not sown separately but it is grown along with jowar grain crop so the cultural practice is the same as with jowar grain crop. Generally the land is not cultivated intensively. The land is ploughed once or twice with desi ploughs in alluvial and red soil under medium rainfall conditions and then worked with blade

harrows while on black soil blade harrow alone works and ploughing is done once only in two or three years with a heavy plough drawn by two or three pairs of bullocks. Recent experiments indicate that in black soil special advantage for ploughing is necessary. Thus four operations are given to prepare the land. Before the sowing the field is harrowed twice, where land is ploughed by tractor and is harrowed by tin cultivator twice. The frequency of cultivation depends upon the crop. When jowar follows sugar cane, cotton or arhar crop, deep ploughing is necessary.

Jowar is mixed with legumes such as moth, cowpea and guar. In Bundelkhand it is usually mixed with cowpea. Irrigated jowar is sown early for fodder. In some places jowar is sown in lines by seed drill, specially in low rainfall region. But at many places of Bundelkhand farmers give space of 25 cms. between two rows. The seed rate is generally 50/60 quintal per hectare. When sown mixed with legumes the seed rate is reduced to half. Early sowing starts in March - April and late sowing continues upto the mid-August.[5]

In 1969-70 in Jhansi the percentage of the area of jowar fodder was 11.07 hectare, in Jalaun 10.52 hectares,

in Hamirpur 16.61 hectares and in Banda it was 13.44 hectares.[6]

IRRIGATION: Irrigation is applied when rain fails. Mostly one or two irrigations are given. Early sown crop requires a pre-sowing irrigation and subsequent irrigations are given at 10 - 15 days intervals. The late sown crops require only one irrigation in September.

Experiment was conducted by Indian Grassland and Fodder Research Institute, Jhansi in 1972. The result revealed that irrigation at optimum level (control level) gave the maximum yield.

MANURING: When jowar is sown year after year without any intervening crop, any fertilizer can be given to the soil. When rainfall is low jowar is seldom manured and when rainfall is medium 50 - 70 quintals of manures are applied and covered by means of blade harrow. In Bundelkhand farmers give 60 kgs. phosphorous pentaoxide and 50 kgs. potash, 60, 60, and 30 kgs. nitrogen is applied at 1st, 2nd and 3rd cut.[7] If the farmer can not afford manure with farmyard manure, a dressing of 112 kg./ha of ammonium sulphate under non irrigated conditions is recommended.

HARVESTING: Harvesting is done when earheads are fully

emerged and fodder is in the early dought stages. On first cut at interval of 45 days care is taken that jowar should not be cut for feeding animals before its flowers as otherwise there is a risk of cattle poisoning owing to the presence of cyanogenic glocoside in your plant. Due to this reason jowar is not recommended for pastures. In jowar two cut are made, one is single cut and other is multicut.

YIELD: Fodder jowar is shy seed yielder unless see yields are increased to get economic returns. Popularisation of this fodder will be hindered. After taking demonstration of some villages of Bundelkhand region it is expected that yield will be 4001/hectare.

FEEDING VALUE: Jowar is mainly a good fodder for live-stock. The feeding value of jowar is given below :-[8]

D.C.P.	8%
T.D.N.	15%

It is shown by feeding experiments that the value of a hectare of sorghum is about 50% higher when fed in the form of silage than fed as fodder.

MAIZE: Maize is one of the most important economic plant serving as food for man and fodder for cattle. It has been

cultivated from olden times. It is a most important forage crop of Bundelkhand region. In this region the area and production under maize crop is steadily increasing.

It is an ideal forage crop as it is quick growing, high yielding, palatable and nutritious. In case of maize there is no risk of praussic acid poisoning, so animal can feed on young plants and it can be cut for fodder in two months after sowing. It is one of the high succulent fodder which increases milk of animals, particularly when it is sown in combination with legumes.

CLIMATE AND SOIL: Maize is a crop of warm climate. It can be cultivated in regions where the night temperature is fairly high. It yield is reduced and growth is retarded by cold spells. The required temperature for its growth is 25°C to 30°C. But it can be sown quite early when maximum temperatures are just around 15, 5 degrees centigrade.

This crop is not suited to poor and water logged lands. It requires well drained and somewhat heavier type of soils. Light soil is cropped with maize when a heavy dressing of farmyard manure is provided.[9]

VARIETIES: The main varieties of maize in Bundelkhand region are given below :-

(1) Type K.41

(2) N.P.I

(3) Ganga 6

(4) Jawahar 2 Kisan

CULTURAL PRACTICES: Maize has not required very intensive cultivation. In alluvial soils the land is once inverted by plough and subsequently cultivated 2 - 3 times with desi plough. Three to four bakharings are normally sufficient to prepare the seed bed in black and red soils. Shallow seed bed is good for sowing of maize.

Maize is sown from the last week of March to the first week of August. Normally it is sown broadcast. But in lines, it is sown 30 cms. apart and the length between two plant is 15 cms. The seed rate is 50 - 70 kg. per hectare if sown broadcast but if drilled the seed rate is 40 - 50 kg.

Area under fodder maize expressed as percentage of the cropped area in 1969-70 was 1.70 in Jhansi, 0.604 in Jalaun and 0.007 in Hamirpur.

IRRIGATION: Early and late crops are sown invariably under irrigation. The main crop is sown with the on set of monsoon. Early or late sown crop requires 2 - 3 irrigations for fodder

production. The mid season fodder crop being more profitable it should have frequent irrigation if rainfall is inadequate.

MANURING: Maize is manured for better yield but no manure is necessary if followed Berseem.

In Bundelkhand region mostly 120 kg. nitrogen is given. Nitrogen is mixed with earth, it is broadcast and then hoed-in with bakhar or desi plough. Maize does not require much phosphate except where soil is very deficient available. In this region about 60 kgs. phosphorous per hectare and 60 kgs. potash per hectare is given to the maize.

The commonest mixed crop of maize is cowpea. But other crops such as Moth, Mucuna are also mixed for fodder. The heaviest yield of jowar is obtained when it is mixed with Mucuna.

The expected yield in Bundelkhand region is 400 - 500 kg./ha.

NUTRITIVE VALUE: Silage of maize contains 7.67% protein and fodder contains 6.74% protein.

COWPEA: It is also one of the important Kharif legume crop of Bundelkhand region and has been cultivated from very

early time. It is replacing other kharif legumes such as Mung, Moth. Both soil and atmosphere of this region are less suitable for its growth. So production of cowpea in Bundelkhand is less.

CLIMATE AND SOIL: Cowpea can grow in all tropical and sub-tropical climate and on a wide range of soils, but moist medium loam are best for this crop. It can also be grown on sandy soils and heavy soils although for heavy soils it is more suitable.

It can withstand both moderate draught and heavy rain. It can also be grown well under the shade of tree but can not suffer cold and frost. It can be grown in any month of the year except the hottest summer month.

VARIETIES: Experiments have been conducted on some varieties by Indian Grassland and Fodder Research Institute and main selected varieties are N.P.(K) 397 as an early variety, N.P.(K) 585 as a mid season variety.[11] Of these N.P.(K) 397 has become a very popular fodder for mixed cropping with maize and jowar. The main varieties are Russian Giant.

CULTURAL PRACTICES: Cowpea does not require very intensive preparation of soil. On alluvial soil 2 - 3 cultivation with

desi plough will be sufficient. It is a crop like sugar cane or arhar. In black and red loam soils 3 - 4 harrowing with bakhar will suffice to bring the seed bed into good condition. Although the crop does not require a deep seed bed but the soil should be fertile. The seed rate should be 30 kgs. per hectare. The seed rate is halved when it is sown mixed with maize and jowar. Heavy seed rates do not give any appreciable advantage. The seed is usually sown in rows between napier. The distance between two rows is 25 cms. apart and seeds are mixed with the soil by cultivating the field. Sowing should be started from April - May and continues upto early October / November when berseem is over.

IRRIGATION: Cowpea can withstand both moderate drought and heavy rainfalls. Early sown crop raised slowly under irrigation while last sown crop requires irrigation at 12 - 15 days intervals during summer. Monsoon crop does not require irrigation. The soil absorbs most of the water occuring in the rainy season.

MANURING: Cowpea is not generally manured beyond 75 to 125 /ha of farmyard manure applied after the second ploughing. It re-cooperates the soil and replenishes the exhausted nitrogen. 20 kg. nitrogen/ha or 40 kg. postash oxide per

hectare may be applied[12] but according to the Indian Grassland and Fodder Research Institute the manure requirement of cowpea is Nil.

HARVESTING: The crop is ready for harvest in 60 - 70 days. Early and late season crop takes more than two months. But monsoon crop is ready early in 60 days. So, the crop is harvested in 60 days. Only one cut is required.

YIELD: The local varieties give about 120 quintals per hectare and the improved type gives over 230 quintals per hectare. Yield expected by I.G.F.R.I. is 100 quintals/ha. It is also observed that the application of 30 kgs. P_2O /ha increases the yield of cowpea to over 250 quintals/ha.

FEEDING VALUE: It is succulent and nutritious fodder. Only hay may be prepared in cowpea D.C.P. content is 2.5% and T.D.N. is 14%.

BAJRA: It is also an important crop of drier Bundelkhand region. It is inferior to jowar and is cultivated only in tracts with less than 50 cms. rainfall without any or meagre irrigation facilities. The crop can withstand conditions of drought for prolonged periods. Its high tillering capacity makes it an ideal crop for dry area.

The crop can be grown on all types of soils except very heavy soils. But generally light soils, which have poor water holding capacity are cropped with bajra for fodder. It can tolerate a certain amount of salanity. Very wet soils are unsuitable for this crop.

VARIETIES: The main varieties of Bajra in Bundelkhand region are :-

(1) H.B.1

(2) H.B.3

CULTURAL PRACTICES: Bajra is generally cultivated on light soils and 3 to 4 ploughing are sufficient for seed bed. Removal of stubble of the previous crop is necessary. In black cotton soil harrowing by bakhar is carried out after the removable of stubbles. This may be necessary for three to five times at the most. The preparatory tillage should be completed before the monsoon sets in.

The seed of bajra should also be sown in lines 25 cms. apart by drilling with the plough. The seed rate of bajra is 10 kgs. per hactare. Broadcast sowing is not good as it gives a very uneven stand of the crop. In dry areas where atmospheric aridity is high it may be sown as early fodder crop under irrigation.

IRRIGATION: The pre-monsoon crop requires about 3 - 4 irrigation. Normally no irrigation is necessary for monsoon crop and is irrigated only when untended to turn into kadbi as monsoon is generally over before the crop is ready for this purpose. It requires irrigation at 7 - 10 days intervals.

MANURING: 80 kgs./ha of ammonium sulphate is mixed with soil in ratio of 1:3, should be dressed in between the roots of bajra and soil, worked with bakhar and mixed up with the soil. It requires 60 kgs. of P_2O_5.

HARVESTING: The fodder is normally ready after 50 - 60 days of sowing in the monsoon season. The early monsoon crop takes more than 65 days. Similarly late crop requires more time to get ready. Bajra is harvested after 70 - 74 days for kadbi, when the grain is in milky stage. After harvesting the crop is placed in the window for a couple of days and then lifted and st cked in the field.

YIELD: The fodder yield is depending upon the rainfall and manuring. In Bundelkhand region the expected yield is 350 - 400 quintals/ha.

GUAR: It is leguminous fodder crop of the dry tract of the Northern India but not very common in Bundelkhand region. It is normally sown mixed with jowar and bajra for fodder. It is

a hard crop and can withstand prolonged drought periods. The pods form an important vegetable. The seed is used as cattle feed and also exported for manuring factor for guar gums.

CULTURAL PRACTICE: Normally one stubble ploughing allowed by desi plough will suffice to give tolerably good seed bed. A weed free field gives good stand of the crop. Being a legume it requires open and well aerated soil. If the soil is water logged it must be drained off and opened up before the crop is seeded. The best time of sowing guar is with the onset of monsoon. But for early fodder supply the sowing should be started in the middle of March and should remain progress upto the middle of August. The August sowing gives relatively lower yield than the June and July sowing and even the early sowings. Seed can be sown either with a suitable desi plough or with a kharif seed drill. The seed rate of guar is 32 kgs. per hectare when sown under irrigated conditions but in Bundelkhand region the seed rate is 25 kgs./hectare.

MANURING: Normally this crop is not manured. But the experimental work indicates that it gives a good response to application of super-phosphate on phosphate deficient soils. The dose recommended is 20 kgs. nitrogen and 60 kgs. phosphorous oxide. Ther fertilizer should be applied before seeding.

preferably in the furrow. Besides increasing the yield of fodder, this also improves the quantity of fodder.

IRRIGATION: Irrigation is essential for the early sown crop. The first irrigation is given for pre-soaking the land to prepare the seed bed and sow the seed. The next irrigation during the hot weather is required. After 15 - 20 days of sowing. Crop sown in the monsoon season hardly requires any irrigation.

VARIETIES: Main varieties of guar in this region are the following:-

(a) HFG - 444

(b) HFG - 227

(c) HFG - 313

(d) HFG - 128

HARVESTING: The crop is harvested usually 60 - 65 days of growth. The period of growth depends upon the season. Mixed crop takes a little more time to be ready for fodder.

YIELD: The yield of pure guar which is harvested for green fodder after 65 days is about 3 - 5 quintals/hectare.

MAKCHARI: It was imported from U.S.A. into India in early twenties. Now it is grown largely near the cities on

sullage water. In Bundelkhand it is found in small quantity. The main problem for its extensive use is the limited availability of seed of this crop. This fodder is superior to jowar and maize.

SOILS: Loamy soils are most suitable but it can be successfully cultivated from light to heavy soil. It grows on well drained and fairly rich soils, but can not be cultivated on ill-drained soils.

CULTURAL PRACTICES: It grows only on rich soils. The field must be free of weeds. The stubble land is, therefore, ploughed once to clean the soil of woody undecompostable material. Thereafter the land is cultivated three or four times to prepare a good seed bed. They are ploughed only once in three years.

SOWING: Sowing is started from early March to late August. The seed rate of Makchari is 180 kgs. - 200 kgs./ ha. When sown mixed with the legume, seed rate is reduced to half.

MANURING: Two months after the sowing, 40 kgs. nitrogen/ha at the base sowing and 80 kgs. N/ha at top dressing may be applied.

IRRIGATION: It is essential for low rainfall areas. Irrigation is required frequently during the hot weather. The irrigation

is supplied at 10 - 15 days intervals.

HARVESTING: The crop is usually ready for harvesting in about 80 days. The crop is harvested at a height of 10-15cms. above ground for the first cutting.

YIELD: It is found that a green fodder yield of over 408 quintals/ha could be obtained in a growth period of 150 days.

MINOR CULTIVATED FODDER: Various minor kharif fodders are Moth, Swank, Soyabean, Ragi and doliches biflorus. Out of fodders the last two are found in South India. In Bundelkhand region production of Moth and Soyabean grains is very lean. So the fodder of Moth and Soyabean is negligible in Bundelkhand region.

2. RABI FODDERS:

OATS: Oat is a very nutritious rabi fodder of Bundelkhand region. Inspite of its very high nutritive value and palatability it has not become a very popular fodder crop.

CLIMATE AND SOIL: It is one of the chief irrigated winter fodder. Commonly grown for cattle as horses, it can withstand prosty condition but can not tolerate long drought. The period of fodder supply is limited from December to

March. All types of soil can be put under this crop with sewage irrigation. It is also a salt tolerant crop. Loamy soils are best suitable for good growth. It gives less profuse growth on ill drained soils. It likes medium texture soil.

VARIETIES: The Oat varieties are two. One is early and the other is late manuring variety. These varieties have been selected in the Punjab. Four Oat varieties are evolved at different Fodder Research Institutes, which are NP1, NP, NP2, NP3 and Australi n. Out of these NP3 is early fodder type. But in Bundelkhand only three varieties are selected by the Indian Grassland and Fodder Research Institute, Jhansi :-

(1) Kant

(2) I.G.F.R.I.-5 - 2688

(3) I.G.F.R.I.-5 - 3031

CULTURAL PRACTICES: For Oat the land should be thoroughly prepared to obtain a fine seed bed, 6-5 ploughing with desi plough should be drilled uniformly. The seed rate is mostly 100 kgs./ha where the crop raised is unirrigated or on the conserved soil moisture, the seed should be soaked.

IRRIGATION: Oat requires frequent irrigation at 75 A.S.M.

Irrigation helps in tillering and subsequent growth of the crop. Dry conditions or restricted water supply at tillering stunts the crop and reduce the fodder yield. Irrigation together with the use of nitrogenous fertiliser is much more helpful than irrigation alone. First irrigation is given after 18 - 22 days after sowing and subsequent irrigation is given at 12 to 15 days intervals.

MANURING: On a loamy soil under irrigated conditions good yield of oat is commonly obtained. This can be very much pushed up by the use of fertilizers. Basal application of 60 kgs. nitrogen and 50 kgs. phosphorous at sowing is good for good yield. After first cutting 30 kgs. nitrogen/h is given. Kant variety requires 100 kgs. N/ha.

HARVESTING: First cust is given at 50% flowering and the second cut is given after 45 days of the first cut. For preparing hay, Oats are harvested when the fodder is in soft dough stage. This stage is about 15 days ahead of the manuring of the crop. At this stage it is pale and green in general look. The hay crop after harvesting is kept in the window for drying and then stocked.

YIELD: The yield after maize seldom exceeds but after guar, cowpea etc. which have also been removed for fodder, it may

be go more. In Bundelkhand region it is found that 200 to 400 quintals of Oats fodder can be obtained from one hectare land.

BERSEEM: It is adopted in semiarid climatic regions. Though its growth is restricted, it can withstand low freezing temperatures. Sowing being when the maximum temperature is nearing 32°C and the minimum temperature is 12.5°C. The germination suffers with higher temperatures. It is successful as an irrigated crop and supplement fodder during winter and summer seasons.

CLIMATE AND SOIL: The climate of Bundelkhand region is very suitable for berseem. Owing to this reason, berseem is found in large quantity. The crop can be grown on all types of soils but the best performance is noted on loamy soils with free drainage, good aeration and high water holding capacity. It requires frequent irrigations on light soils. The growth is luxuriant on heavy soils because of poor aeration.

VARIETIES: Pusa giand berseem is the main variety of Bundelkhand.

CULTURAL PRACTICES: Berseem is sown after maize, jowar, bajra or paddy. Normally these crops are harvested in

October - November. Within a very brief period 2 - 3 cultivations are given and then the seed is sown. After paddy it is necessary to dry the land a bit before it is cultivated for berseem. Soil inversion with S.T. plough is also very useful. In all, 2 - 5 cultivations are necessary with desi plough and all clods are broken by pata. The field should be kept free of weeds such as doab.

Berseem is sown by two methods. Berseem seeding in standing water is more common than dry sowing followed by irrigation. In both the cases the seed is sown broadcast. When berseem crop is sown for the first time, before seeding, the seeds are moistened overnight and mixed with bacterial solution. The crop is sown in mid-September. The seed rate of berseem in Bundelkhand region is 20 kgs. - 30 Kgs./hectare.

MANURING: The fertilizer experiments conducted at many Institutes reveal that berseem is one of the most responsive crops to phosphate fertilizer. The response to phosphate application on berseem has been found 80 kgs./ha.

Recent studies have shown that potash application is seen to help yield of 2nd and 3rd cut increase by 15%. Studies conducted so far have shown that foliar spray of

of super-phosphate at 4% P_2O_5 and composite of micro-organism, micro-nutrients after the 3rd cut helps in increasing seed yield by 30% to 50% over control in different years.

IRRIGATION: Berseem requires very large quantities of water for good yield. Under well cultivation 20 - 25 irrigation at 75% A.S.M. are applied. Initially for germination and establishment the crop requires irrigations at weekly intervals.

HARVESTING: Berseem is harvested by sickles or talwar. When crop is sown in September, the crop is harvested in late November or early December.

YIELD: Berseem, a high tonnage fodder crop, has given 1250 N/ha with proper cutting management. It is also a low seed yielder.

LUCERNE: It is a fodder for horses. It has wide adaptability to various climatic environment. In hilly regions it is available in summer season and in plains it is principally a winter fodder crop. It is not very common in Bundelkhand region because it is successfully cultivated in irrigated regions.

SOILS: Deep black cotton soil is very suitable for it. On

loam soils it gives a better yield than on heavy soils. It can also withstand long periods of drought but red and laterite soils are less suited for its growth. It requires heavy lime. Sandy soil also give poor yield.

VARIETIES: In Bundelkhand region mostly two varieties are common i.e. I.G.F.R.I. - 244 and 254; these varieties are conducted at I.G.F.R.I.

CULTURAL PRACTICES: The land must be cleared of weeds otherwise the growth of the crop is much supressed. The field should be ploughed and subsequently harrowed with bakhar or desi plough, repeatedly for 5 - 6 times. While the soil has obtained a fine tilth, the field should be thoroughly levelled to avoid stagnation of water. The seed rate of lucerne should be 20 kgs. - 25 kgs./ha. Its seed takes considerable time for germination and crop takes a quite a long period to establish. The crop is sown from October to November. The seed is sown broadcast.

MANURING: It requires 25 kgs. N/ha, 100 kgs. phosphorous/hectare and 50 kgs. potash/ha. The dressing of super-phosphate is applied in October. It is drilled in between the rows.

IRRIGATION: It requires intensive irrigation. Frequent irrigations at 8 - 10 days intervals are needed. This interval is longer in the winter season. During monsoon season it seldom needs any irrigation. Lucerne is quite drought resistant. Bushy and vigorous growth is obtained by frequent irrigations, which are more beneficial than deep irrigation at long intervals.

Interculture is very necessary for this crop because lucerne in the initial stages developes root system and then the branches and foliage. Therefore, if the crop is supressed in early stages by weed growth, the establishment and outturn are poor. The weed should be removed at short intervals. Drill sown crop can be inter-tilled with desi plough.

HARVESTING: The crop is harvested from December to May. It is harvested either after every month or after 1 ½ months when almost one-tenth of the crop is in flower. In Bundelkhand region mostly 6 or 7 cuttings are given.

YIELDS: In Bundelkhand region about 600 quintals/hectare of green forage can be obtained with 80 kgs. P_2O_5/ha.

SENJI: It is one of the most important fodder crops of Punjab, but not very common in Bundelkhand region. It is associated with the growing of cotton crop under irrigated conditions.

It is very nutritious fodder crop and can be fed in mixture with straw of wheat, barely and oats.

SOILS: It can not be grown on wet clayey soils or somewhat saline soils. It is most suited to light sandy loam. It does not require very rich soil for good growth but it must be well drained. The soils are suitable for cotton and it is also suitable for senji.

CULTURAL PRACTICES: It is sown after cotton, jowar, bajra or maize. After harvesting the previous crop, the land is opened up and stubbles are removed. 5 - 6 ploughings are necessary to prepare a good seed bed.

SOWING: The crop is sown in October - November. It is sown earlier than October or even later but then it will not give a good yield. The seed rate of senji is 20 kgs. - 25 kgs./ha. It is sown broad in the standing crop of cotton and maize. When it is sown with standing crop of cotton and maize, no cultivation of the crop is possible.

There are two months of the sowing. In one case the seeds on a cultivated field are broadcast in standing water after the field is puddled.

MANURING: Normally farmers do not supply any manure to this crop as it utilises the residual fertility. But it is observed that the application of superphosphate promotes the crop growth very much. The superphosphate should be mixed with soil at the time of final cultivation and not at the time of seeding. 25 Kgs. nitrogen/ha and 50 kgs. phosphorous/ha should be applied.

IRRIGATION: It does not require heavy irrigation as its growing time is limited to four months and the yield per cutting is low. Thus, in all, 5 - 6 irrigations are needed by the crop. In summer and spring seasons the irrigation interval is decreased. Excessive irrigation is very detrimental to the growth of the crop.

HARVESTING: The crop is harvested with sickles. But this can also be grazed by animals. The crop is harvested in February and March. The Crop is harvested only one time.

YIELD: The expected yield of this fodder is 150 quintals - 200 quintals/ha. It is seldom turned into hay or silage.

MINOR CULTIVATED FODDERS: The different minor cultivated rabi fodders are shaftal, methra, pillipesera, val, Indian vetch, field peas, rape and turnip.

Except the turnip and the rape, the rest of the fodders are leguminous. The mode of cultivation and establishment and agricultural operations in the case of shaftal and methra are similar to those of berseems.

Shaftal, pillipesera, val, Indian vetch and field peas are not found in Bundelkhand region. Pillipesera is mostly cultivated in Orissa, Andhra Pradesh, Madras and Kerala. Val is an important fodder of Gujarat. It is cultivated like cowpea.

Only rape, methra and turnip are cultivated in Bundelkhand region.

METHRA: This is herbaceous fodder which has been cultivated from ancient times.

CLIMATE AND SOILS: Methra can be grown in all climatic conditions. It thrives well on well-drained, medium black soils. On lighter and poorer soils it requires the aid of irrigation and the forage becomes less succulent.

CULTURAL PRACTICES: Methi is grown both as rainfed and as irrigated crop. Under irrigation the crop is naturally heavier than a rainfed condition. Under well irrigation, methi usually follows bajra and the land remains sufficiently fertile to sow methi without any further manuring or tillage. Farmyard manure is applied to the previous crop, but methi is sown without any cultivation or manure. Methi is sown in October - November. The seed rate is 30 kgs. - 40 kgs./ha. The main variety is only Indian Methra.

It requires 30 kgs. nitrogen/ha and 10 kgs. phosphorous/hectare. 4 - 5 irrigations are given to it. The crop is harvested in February and March.

NUTRITIVE VALUE: Methi is used as a pod, herb or leafy vegetable. When the seedlings are in two leaf stage of growth it can be cut and fed green to live-stock. The first cutting can be taken in two months and continued for three or four more weeks according to the requirement of farm animals. Unlike other pulses, methi is used only as a green forage and hardly changes into hay and silage. It contains 3.6% crude protein.

RAPE SEED: This is one of the major oil seed crops.

Experiments have shown that for fodder purpose dichot-oma is the best. Another specie that is useful both as fodder and as a vegetable is Indian mustard or rai.

It is usually grown as a pure crop but rai and sarson are gradually grown mixed with wheat, barley or grams.

Rape is very useful for feeding of sheep and ideal for cattle. It is easy to grow, vigorous and adoptable to various soils as climates and is also quite responsive to manuring and good cultivation.

SOILS: It thrives best on loamy soils and cool climate but liable to get damaged by frost. For rape, black loams are the best.

CULTURAL PRACTICES: Rape needs a perfect tilth to grow well. Two or three ploughings will be needed, followed by harrowing and levelling. Manuring is also necessary. Seeds may be sown broadcast or drilled in row. It requires about three irrigations.

Rape seed is often grown in mixture with shaftal. The rape plants grow quicker and increase the bulk of the first cutting of the legume by November and also furnish a balanced forage.

HARVESTING: It requires three cuts for fodder when rape is cut for fodder. Care should be taken to leave a large stubble, otherwise no second or third cuts will be possible. sometimes only two cuts are taken for fodder and the third is left for seed production.

Being a succulent feed, great care should be taken to avoid bloat. A little maize or barley or mixed with dry grass should be included to balance the ration, and possesses the nutritive value. The cattle should be led into a rape field when they are very hungry on dew mornings.

3. CULTIVATED GRASSES:

The important perennial cultivated grasses are the following :-

(1) Napier Grass

(2) Guina Grass

(3) Sudan Grass

(4) Para Grass

NAPIER GRASS: This is vigorous, hardy, high yielding perennial grass and is derived from Africa. In its native habitate it grows to a hight of 3 metres to 3.6 metres and as elephants are seen roaming inside the forest, hence the grass is also known as elephant grass.

<u>CLIMATE AND SOIL</u>: It grows on irrigated area. It can grow on a wide variety of types of soils and moisture variations, but can not survive in water logged fields. Although it prefers a warm climate, it can also withstand low temperatures in sub-tropical regions.

<u>CULTURAL PRACTICES</u>: This is sown by vegetative means. The clumps are dug up and separated into rooted slips, each bearing a live and healthy bud. The field is prepared by ploughing four to six times. Rooted slips are planted about 60 cms. apart in furrows and covered with soil. In this method the irrigation is given only after the sprouting is complete.

Another method is to cut the clumps into pieces as in the case of sugar cane, each with three nodes. Nodes are buried in the soil just enough to cover the second node joint, the third joint being left above the ground level. The best time of sowing in Bundelkhand is from February to August.

Irrigation will be needed at fortnight intervals and also soon after each cutting, except during rainy spells.

<u>MANURING</u>: Being a heavy yielder, Napier grass requires liberal manurings, with 125 quintals to 250 quintals/hectare

of farmyard manure. It requires 100 kgs. nitrogen per hectare and 50 kgs. phosphorous per hectare.

<u>NUTRITIVE VALUE</u>: Napier grass is nutritious and all the varieties contain similar protein content. It is observed that a goat can maintain body weight if fed only on napier grass along with a little quantity of salt.

The nutritive value of the grass is improved by growing velvet beans or cowpea in the same field.

For hay making this grass is somewhat too coarse, but it can be used for making silage and for rotational grazing.

The cultivation of Napier grass in Bundelkhand region is negligible because climatic conditions are unsuitable for this grass and most of the farmers have no cultivation facilities. In Bündelkhand this grass grows automatically near nalas.

<u>SUDAN GRASS</u>: Sudan grass is quick growing, drought resistant, which can be very useful for hay, silage or pastures. Under favourable conditions it can be cut and grazed several times without damage.

<u>CLIMATE AND SOIL</u>: Like sorghum, sudan grass thrives best in a warm climate and is a crop of semiarid, tropical and

and sub-tropical regions. It can grow on all soils i.e. from heavy to light soils provided they are well drained. Alkaline soil is unsuitable for it.

CULTURAL PRACTICES: Sudan grass is propogated by seed. To prepare the land for sowing, two or three ploughings or two harrowing will be needed.

It is sown in July - August. The seed should be sown 2.5 c ms. deep in the soil. When sown broadcast the seed should be covered by a brush or tooth harrow. One interculture when the plants are about 25 cms. to 30 cms. tall, helps to remove weeds and gives the plant a better start. The seed rate should be 8 - 10 quintals/hectare.

MANURING: Like other grass it also requires heavy manuring. The manure requirement is lesser than Napier, Para and Guina grasses. The best time of manuring is October. On dairy farmsmanuring with composed dung will be cheaper but on arable farms, the fertilisation will be less.

The field after planting is immediately irrigated. The straggling shoots of the grass are used as planting material, cut into different lengths, each with two or three

nodes and these slips are planted in the row. Under irrigation, the planting is best done in March, but as in rainfed crop it should be planted at the beginning of the monsoon months.

Being a water loving grass, liberal irrigations at fairly close intervals are necessary. The intervals between irrigation should be adjusted so as to keep the land always moist.

Liberal manuring is also necessary. The crop is harvested in three months after the planting.

UTILISATION: The grass is best when it is green for feeding the live-stock. The cattle do not eat this grass too readily to begin with and mature culms are often rejected. It should, therefore, be cut and fed when it is yound and not too old. Grass cut with the morning dew is also apt to be rejected by cattle.

RHODES GRASS:

CLIMATE AND SOIL: The grass can tolerate drought and low temperature and can grow well in both tropical and sub-tropical parts. It grows best on light loams. It can tolerate a fair degree of salinity.

CULTURAL PRACTICES: The land must be prepared thoroughly and be free from weeds specially other grasses. This is necessary otherwise the young seedlings will be smothered. After thorough ploughing the farmyard manure is spread in a thick layer. The seedlings should preferably be transplanted early with the start of monsoon season.

Inter tillering is also necessary. A light harrowing in the spring has been found very beneficial to stimulate growth of fodder.

MANURING: For the high yield of fodder, heavy manuring is required by this grass. When these are sown under sewage conditions, there is no need of supplemental manuring. Otherwise the minimum dose of farmyard manure is to be dressed unless the quantity available is less.

IRRIGATION: It requires less irrigation than the other grasses. It will produce fair in region of low rainfall. It can withstand prolonged periods of drought. It requires irrigations at 15 - 18 days interval in the summer season and the intervals increase in autumn and winter months.

HARVESTING: This grass begins to grow vigorously with the onset of spring. It is harvested in March.

This grass is much relished by the cattle for grazing in the pasture, but its production is negligible in the Bundelkhand region.

GUINEA GRASS: The grass thrives best in warm, moist climate. Under ûnfavourable conditions it remains green and productive all the year round. In the absence of adequate moisture the grass goes dry and dormant, but it resumes its growth with the beginning of the monsoon rains.

The grass can grow on almost all types of soils except water logged ones, but it thrives best on light sandy soils; heavy manuring is necessary to secure good yields. In Bundelkhand it grows along field, bunds and sides of water canals.

The grass is propogated mainly by vegetative means through planting rooted slips.

The land is prepared well after giving two or three ploughings followed by two or three harrowings. To obtain rooted slips a whole clump is dug up with the roots to a depth of one foot and is divided into several parts. These divided slips are then used for planting. The slips are planted in rows, 75 cms. apart. For a rainfed crop,

the planting should be done at the beginning of the monsoons. Under irrigation planting can be done any time of the year. Usually planting is done from February to August.

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CHAPTER IV

PROCESS OF FODDER CULTIVATION:

1. PROPOGATION AND TIME METHOD SOWING:

For the process of fodder cultivation, it is necessary to know the appropriate technology of forage farming. Quality and quantity fodders are required to have the characteristics of short duration, quick growing, light yielding, nutritious, palatable, low imput and adaptability to the adversities of the area. For best stand cultivated grasses need some interculture and weeding in initial stage. In low rainfall period when the sown grass takes sometime to establish itself one or two hoeings are necessary in badly weed-infested field. In Bundelkhand region hand-weeding is very common. Animals should be allowed to graze in the field when the grasses have fully established themselves otherwise the young plants are smothered.

PROPAGATION: Sowing of the fodder crop is the primary

step on which the whole production potentially depends. There are two methods of propagation. The first is by seeds and the second is by vegetative reproduction.

BY SEEDS: This method is seeding of pasture, controlled and deferment grazing. In Bundelkhand this method is very common because it is suitable for arid and semiarid regions. The seed is sown in furrows, not more than 2 cms. to 8 cms. deep in depth. If the land has very high concentration of weeds of woody nature and there is thick growth of undesirable grass, cultivation of soil is very essential to uproot the natural woody growth. After this the furrows can be drawn for seeding in the field. The seed rates differ in relation to the seed size, the viability of seeds, the moisture conditions and the mode of dispersal of seeds.

Seeds produced by plants in particular season can be sown for fodder in the subsequent season. Crop performance is highly affected by quality of seeds. This method of propagation is highly adopted in case of annual fodder crops like jowar, bajra, berseem, oats, cowpea and guar. Some perennial grasses are also to be propagated by this method. For seeding first of all natural wood weeds are to be

removed by the cultivation of land. After this the furrows can be drawn for seeding in the field.

If the quantity of seed is limited, it should be sown in Petri dishes in sterile soil at optimum temperature, harvested plants show poor germination on account of dormancy. For breaking of this dormancy, special treatments are necessary, such as alteration of temperature, keeping the moistened seed at higher or lower temperature levels, pre-soaking in chemical solutionlike potassium nitrate.

BY VEGETATIVE REPRODUCTION: This type of propagation is generally followed in perennial crops. Under this system the crop is established by rooted slips as in napier, by rhyzoms as in sarson, by cut pieces of stem as in bulb. Thease materials are planted in favourable seasons to establish the forage crops.

In this method the tillers may be separated and planted in pots or in small plots. For making the establishment easier, the tillers are first rooted in water, immersing them in about one inch of water and changing the water two or three times a day . Tiller from the same plant may be kept together by a string or elastic band. The tillers may

be planted out when new roots grow about half an inch long.

PLANTING: Two or four tillers seedling or germinated seeds are grown in clay pots in green houses. After planting, the soil around the plants should be firmed in by hand.

For quick regeneration of superior grasses the following things are very necessary :-

(1) Fencing of the area
(2) Water conservation
(3) Grazing should be restricted to the carrying capacity of the pasture.
(4) Deferment should be carried out early in the season when seeds are germinating and the seedlings are establishing themselves.
(5) Where the stand of perennial species is poor, cultivation of the land brings about regeneration of such species and eliminates annual and undesirable species.

This uproots the undesirable grasses which usually do not allow the seeded grass to establish after germination.

The seed should be sown in shallow rows. Then there is good moisture in the soil. The grass strips should be planted in small pits, dug with a khurpi.

<u>TIME METHOD OF SOWING</u>: Best time of plantation for all the grasses is with the break of monsoon in the summer season. The land should be ploughed once or twice to uproot the woody growth. The seed should be sown shallow in rows and sowing s hould be completed by the end of July. Strips should be planted in small pits, dug with a khurpi or in furrows. The soil is pressed to put them in touch with moisture. In the Kharif season cowpea, guar, sorghum, maize are the best sown in the last week of June to the first week of July but bajra crops can be grown upto the last week of July. Similarly in Rabi season the period from the last week of September to the first week of October is the best sowing period for berseem while Oat can successfully be sown by the end of October. Late sown under the condition of delayed sowing, crops can be grown but the forage production is affected to the extent the sowing period is deferred in the season.

For sowing, the land is prepared in relation to the crop requirement, for example the small seed bed is required

for the sowing of turnip and sarson; and for mucuna fine seed bed is required.

The optimum spacing between two rows of Rhodors grass is half metre and for para grass the distance is two third a metre as mentioned by Dr. P.C. Raheza.

In Bundelkhand region mostly crops are sown by two methods :-

(1) Line Sowing: In this method seeds or planting material is planted in the rows and covered with soil at appropriate intervals.

(2) Broadcasting: In this method the seed is scattered uniformly and mixed well with the soil.

The former method of sowing is scientific which allows the proper utilisation of the land and each of the subsequent operation upto the crop harvest. However, the latter method is quite convenient and common in Bundelkhand.

PROCESS OF CULTIVATION: Fodder production depends upon the management and maintenance of the crops upto the desired stage of harvesting i.e. 50% flowering.

In addition there are several factors which govern

the tonnage of fodder production per unit area. The factors are as follows :-

SOILS: The type of the soil is the first and the main factor of fodder cultivation. Soil habits of fodder are different. Such as cowpea, guar, bajra etc. should be grown on well drained light to medium texture soils. These crops do not give best production on heavy texture soil with high moisture; similarly some grasses like para grass, napier grass can not thrive well on light textured soil.

FERTILIZERS: Nitrogen, phosphorous and potash are the major nutrients on which the production of fodder depends, graminacious fodder such as sorghum, maize, teosine, oat etc. are required to be fertilized with nitrogen ranging from 50 kgs. - 100 kgs./ N/ha and more as in the case of their multi cut varieties. On phosphorous deficit land these crops also respond to phosphatic fertilizer. In general there is not much response of potasic fertilizer in forage. But some crops like turnip and carrots etc. are marked to be the potash loving crops. Perennial grasses in natural grassland do not need to be applied with the above nutrients. Nitrogenous fertilizers are required to be applied in two or more splits

during the entire life cycle of crop while phosphotic and potasic nutrients can be applied as basal doses. Under the condition whence forage crops are raised for seed production, after-few-cuts are required to be applied with the phosphorous nutrients. This technique of phosphate application has given the encouraging results in the seed production of berseem and cowpea etc. at the Indian Grassland and Fodder Research Institue, Jhansi. Besides these nutrients the instances have come to note experimentally that the cultivated fodders like berseem and oat respond to the micro nutrients such as motibdenom, boron and zinc etc.

IRRIGATION: Vegetative growth of the forage crops in general depends on the sufficient soil moisture. In monsoon season irrigations are not required until and unless there is a prolonged drought period. During winter and summer sowing efficient irrigation management is very much essential for economic production. The number and frequency of the irrigation depends on the type of the soil and the critical stages of the crops. It plays an important role in the different parts of the region depending on the nature of the soil. In the region of the black soil irrigation is not absolutely

necessary because of the moisture retaining nature of the soil, good harvest being raised even in years when the rainfall is not abundant, but it is necessary in red soil tracts which are less abundant of the moisture. The low water level and the high topography obstacle in the expansion of irrigation and in consequence the irrigation area has always been insignificant.

The main sources of irrigation are rivers, canals, tanks and tubewells, pumping sets, rahats, etc.

In Jhansi district the following sources of irrigation are found.

(A) MAJOR IRRIGATION: As major irrigations the Matatila dam and the Suparar dam are main resources.

(B) MINOR IRRIGATION: Bundhies, tanks, lakes, canals and tubewells etc. are the main resources of minor irrigation.

Bundelkhand region is backward in agricultural practices and the cultivators are orthodox and conservative in their outlook. They practice old and outmoded method of cultivation. New methods like the U.P. method of wheat and barley cultivation, Japanes method of paddy cultivation, the use of dibbing and line sowing are making some headway

and are gradually becoming better known. The cultivators of the region still use indigenous implements, such as wooden plough, wooden clod thrushers and the bakhar. A plough with a broad blade, four inches wide and about two inches long is very suitable for the preparation of the soil. Field in the particular black soil of the region, whence modern plough have not been found to be very useful. Among modern agricultural implements are winnowing fans, thrushers and iron plough.

3. DEFERRED AND ROTATIONAL GRAZING:

The cause of deterioration of grasslands is due to the over grazing or continuous grazing of animals. Smaller number of well fed animals are better than a large number of half fed animals. For this purpose there should be control on cattle population. In fixing the number of animals all grazing area should be taken into consideration. This is defined as number of animals that can graze in one unit area without over grazing or under grazing. Just like human beings, animals also have their likes and dislikes. Certain grasses are preferred while others are rejected. On account of this selective grazing habit, desirable species are removed faster

than other species that are not so palatable. In most of the perennial grasses, new shoots are produced by utilizing the reserve food material that is stored in underground parts. When the plant produces food material in excess of its growth requirements, the surplus is translocated into storage organs at the commonest of the next growing season. This surplus is utilized for the production of new shoots. Under grazing conditions these fresh shoots get removed by the grazing animals and the plant never gets a chance to build up any reserve of food material. If over crazing continues, the food reserves get exhausted soon and the plant becomes weaker and weaker and ultimately dies. Hence grasslands build up their food reserves before the forage is utilized. For grazing purposes, on deteriorated grassland it is necessary to close the area to grazing until sufficient recovery occurs. This prevents serious injury to grazing land. For this purpose rotational grazing is practised.[1]

As mentioned already above the continuous grazing is an important cause of grassland deterioration, apart from early grazing and over grazing. Although the harmful effects may be reduced when the number of animals is

reduced in continuous grazing, the effect is a cumulative one and may eventually result in the diminishing of the most paratable species. To avoid this risk the grazing must be stopped at some stage or the other that is in grassland terminology, the grazing has to be deferred. Since it will seldom be possible to stop grazing over the entire area, when no other alternative areas are available, the practical method is to defer grazing in a part of grassland and to allow grazing in the other parts in a rotational system.

This system is suitable for grasslands where annual species predominate and when seeding of the perennial species is desired to maintain the density of the grass cover. The grassland is divided into three compartments and grazing is allowed in rotation os that each compartment is grazed for one third of the total grazing season and protected afterwards until the seeds mature. By the time the animals are let into the third compartment, the seeds would have matured and got shed and when the animals come back to the first and the second compartment, the seeds in those would also have ripened and got shed. In the second year the third compartment is grazed as the second and the second compartment is grazed as

the first in the rotation. In subsequent years, the same order is followed for each compartment in rotation so that in three years the grasses in each compartment would have produced enough seed with the partial protection afforded to the grasses.[2]

Assuming a growing period of three months, from July to September, the plan of grazing in this system will be :-

	July	August	September
First Year	I	II	III
Second Year	II	III	I
Third Year	III	I	II

Deferred rotation system provides 50% more animal grazing days than continuous grazing days in the same pasture. Besides that continuous grazing is injurious to the health of the range.[3]

BURNING PROCESS: Burning is a wide spread practice in many parts of India to encourage new growth. This is common in humid region. It is convenient method of removing unutilised herbage residues of the previous year so that a new growth of vegetation may develope unhindered and become available to grazing animals.[4] This has the effect of the

establishment of superior grasses which could not persis in competition with hardy species. Burning is also helpful in encouraging the early spring growth of grasses and discouraging the encroachments of jungle growth. Since burning is a process antagonistic to the process of natural succession both primarily and secondarily it has to be practised with very great care. In humid and high rainfall areas burning may not be very harmful but in arid and semiarid regions burning is definitely harmful.

The object of experiments conducted at Karnal distirict is given below :-

(i) Production of fresh succulent grass immediately after a summer shower.

(ii) Destruction of old grass clumps.

(iii) Eradication of fungi, bacteria.

(iv) Maintenance of the optional grass tree ratio.

The main objective in the management of grasslands is to secure the maximum production of live-stock without any detriment to the productivity of the grassland. It is, therefore, essential to see that the grassland considered is

kept in peak level of productivity for as long as possible.

OUT-TURN: The out turn generally depends on climate, soil, rainfall or irrigation and fertilizer.

Soil habits of fodder are different. Well drained, light to medium texture soil is very suitable for jowar, bajra, cowpea and guar. So, these fodders give good out-turn in that type of soil. These crops do not give best production on heavy texture soil. Production of fodder also depends on sufficient soil moisture. The quantity of water requirement varies for different fodders.

Out-turn of the fodder crops is related with fertilizers. The application of fertilizers to fodder crop has appreciably increased the yields. By applying 80 Kgs. P_2O_5/ha at 75 A.S.M. moisture 1250 quintals/ha yield of berseem is obtained.

In the cultivation of cowpea, phosphate application has shown to increase green fodder yield over 250 quintals/ha with 30 kgs. phosphorous/ha.

In the case of lucerne 600 quintals/ha out-turn can be obtained by 50 kgs. phosphorous pentaoxide.

4. PASTURE LEGUMES:

The legumes which can be introduced in natural pastures or for soil conservation are the following :-

(1) Kudzu

(2) Mucuna

(3) Carpet legume

(4) Bakla

(5) Atylosia scarabocoides

(6) Centrosom Pubescens

KUDZU VINE: It is a rapidly growing legume which is used for soil conservation. It has a very high production capacity and once established covers the ground rapidly.

It is a shy seeder. Therefore, it is propogated by crowns. The crowns are lifted in the early January in pot or in field. A single plant in a year covers about five square metres of the area.

MUCUNA: It is much relished by cattle and is likely to find a place in unirrigated pastures. It is planted by seeds. The seed rate is 40 kgs. per ha. Mucuna is drilled at a depth of 3 cms. in moist soil in rows one metre apart. Once it germinates it covers the ground. For good establishment, the

pasture should not be grazed early in the season.

CARPET: It is quite nutritious and kept green for a long period. It is mainly found in Gujarat. It is also propagated by seed in lines. The seed rate is about 20 kgs./ha.

BAKLA: It is a winter legume and remains dormant during the summer months.

It is sown by broadcasting the seed in the month of September. The seed rate is 4 kgs./ha. The seed takes time for germination. Such a pasture should be closed to grazing. For establishing a new pasture, the seed is sown in lines in between the grass rows.

ATYLOSIA SCARABOCOIDES: It is mainly found in Rajasthan. It can be sown in mixture with grass successfully.

It is heavy seeding plant. Its seeds readily germinate with the onset of monsoon. The seed should be sown in separate rows. Even under desert conditions this legume remains green upto the beginning of February.

CENTROSOM : It occurs in the indigenous pastures lands and is very much relished by cattle. Therefore, in heavily grazed feeds it tends to disappear.

It is found as a wild legume in pastures where

rainfall exceeds 500 mm. It is very palatable pasture plant and cannot withstand heavy grazing. The seeding in plant is heavy and these germinate when moisture conditions are favourable.

<u>SWEET CLOVER</u>: It is also much more relished by cattle. It is a good cultivated fodder under irrigation. Once it is established in a pasture it rapidly spreads. The best method of establishing it is to sow it in lines. The seed requirement is 4 kgs./ha. The plants take a couple of months to establish. The pasture should, therefore, be grazed after February - March. If early grazing is resorted to the young plants will be completely grazed and uprooted. The plants tend to be woody if animals are introduced late in May-June.[7]

In Bundelkhand region only Mucuna centrosoma and Bakla pasture legumes are found.

<u>OVERLAPPING CROPPING SYSTEM</u>: Intensive milk production programme depends essentially on the supply of high tonnage and high quality green fodder throughout the year. To achieve this objective, the I.G.F.R.I. has developed a system of 'Overlapping Cropping' giving over 2000 2pha of

green fodder averaging about 5.5 quintals per day and thus enabling the maintenance of twelve high producing milk animals under Jhansi conditions. This system consists of mixed cropping of berseem with sarson in winter and inter-planting in the first year with hybrid napier in spring and growing a companion crop of cowpea along with napier in the inter-row spaces during Kharif, a total yield of 2599 quintals/ha. green fodder averaging to a green fodder production of 7.1 quintals/ha per day was obtained this year.[8]

Trial was laid out for the first year. The results indicated that overlapping cropping of berseem + sarson - napier + cowpea has given higher yield of 1459 quintals/ha green fodder and 271.4 quintals/ha. dry fodder than the relay cropping 1382 quintals/ha. green fodder and 258.5 /ha dry fodder of berseem + japan sarson - M.P.Chari + cowpea and 989 quintals/ha green fodder for oats - cowpea - M.P. chari + cowpea. The interaction of irrigation and cropping patterns was no significant.[9]

5. <u>INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE, JHANSI</u>:

A grassland is defined as a natural land surface which is covered mainly by members of the grass family of

plants. Grasslands are thus very important as feeding grounds for the live-stock of region.[10]

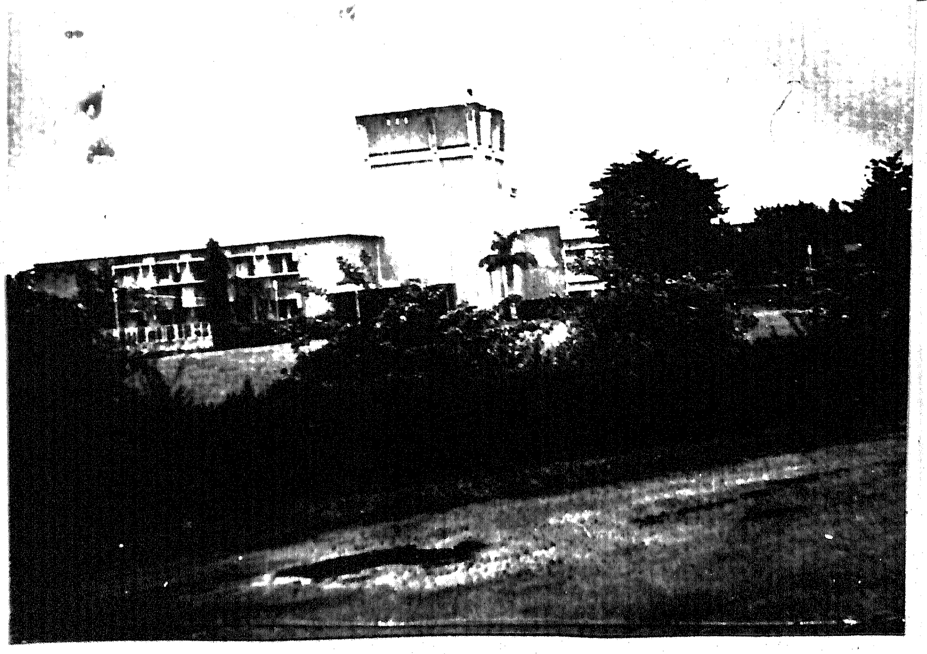
The importance of grasses, grasslands and fodder crops in feeding the live-stock and in the agricultural economy the increasing gap between the supply and the demand of forage, the limitation of earlier studies and the diversity and complexity of the problems, led to the establishment of the "INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE" at Jhansi towards the end of the third Five Year Plan by the Government of India and administered from April, 1966 by the Indian Council of Agricultural Research, New Delhi.[11]

An area of 575 hectares situated at a distance of about 8 kilometres from the town on the Jhansi-Gwalior road was acquired in December, 1962 for setting up the Central Research Farm of the Institute. The farm is located in the transitional zone contrasting soil, types and varying topography.

Following survey of soil and vegetation of Central Research farms for reclamation purposes, the research activities of the Institute began in 1965 with a nucleus staff.

About 356 hectares area are under natural

INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE, JHANSI



grasslands and about 125 hectares are under cultivated fodder.

The plant has a good potential for irrigation and supplementary sources for irrigation water. Along side preparation of blue prints and preliminary estimate for the construction of buildings were undertaken and pursued from time to time for speedy implementations. The research activities are continuously being enlarged and intensified in proportion to the staff and facilities built up from time to time. Keeping in view the priorities and the need of research on forages, the Institute has the following major objectives :-

(1) To carry out research both on basic and applied nature on grasses, grasslands and fodder crops is related to sustained production of high quality fodder for efficient animal production, maintenance of soil fertility and crop production.

(2) To evolve high yielding fertilizer and disease resistant superior quality forage and fodder crops suited for different

agroclimatic region of the country by the use of modern techniques of plant breeding and through the application of research and other disciplines.

(3) To study all aspects of the problems of weeds in cultivated fodder and grasslands and evolve economic measures of their control.

(4) To design and fabricate efficient low cost labour sowing farm.

(5) To collect and co-ordinate research work on the subject in the country by centralising direction, operations and intandance.

(6) To disseminate knowledge on the subject through organised training programme.[12]

SURVEY AND COLLECTION OF WEEDS: Survey collection and mapping of weeds were undertaken in Bundelkhand and several places in the coaster zone representing agroclimatic regions for ascertaining the incidence of kharif weeds. About 240 weed specimens were collected for the weed harbrarium.

The autecology of various weeds so as to locate vulnerable point in their life cycle for their control. During the year the noxious exotic weed parthenium hyteropharus was studied. The weed prepared moist, shady habitats, rich in soil organic matter. It was observed that the plant was a prolific seed producer. A single plant produced 3500 seeds. Flowering was hastened in open, dry situations but the seeds of weed are viable. Scarification as well as temperatures ranging from 15°C - 40°C increased the seed germination of other seeds.

Survey, collection and mapping of weeds were undertaken in areas of Punjab, Bubaneshwar, Barrackpore and Kalyani of Eastern zone representing different agro-climatic regions for ascertaining infestations of kharif weeds. The studies were made apparently in :-[13]

(i) Cultural field

(ii) Wasteland and fallow land

(iii) Ruderals

In case of the paddy fields floristic composition of weeds in the uplands, medium and lowlands as well as deep aquatic weeds were studied. 237 weed specimens have

been collected and processed for preservation in the harbarium of these 124 weeds from the paddy fields, 66 were emergent and mershy habitat weeds. The phytosociological and community complex studies are under way.

An experiment was laid out in Kharif to study the crop weed inter-actions and the extent of competition with weeds in the MP.P Chari fodder crop of fourteen paired plots, one plot selected at random was kept weed free cuts for fodder were taken twice, first at grand periods of growth and the second at mature stages of the crop. It was observed that the weed infection was maximum druing the grand period of crop growth and was reduced as the crop matured. The losses due to competetion at grand period of growth were 24.5% and at maturity 19.9%. Hence, the best period of weed control in this crop appears to be at the early crop establishment.[14]

C H A P T E R   IV

R E F E R E N C E S :

1. Forage Crops in India by T.R.Narayanan & P.M.Dabadghao p. 319

2. Forage Crops in India by T.R.Narayanan & P.M.Dabadghao p.319

3. Farmers Bulletin (1975) I.G.F.R.I. Jhansi

4. Forage Crops in India by T.R.Narayanan & P.M.Dabadghao p. 314

5. Cultivating Fodder Crops & Grasses in India by Dr. P.C. Raheja p. 81

6. Forage Crops in India by T.R.Narayanan & P.M.Dabadghao p. 314

7. Cultivating Fodder Crops & Grasses in India by Dr. P.C. Raheja pp. 84, 85

8. Annual Report (1972 - 74) I.G.F.R.I. Jhansi p. 15

9. Farmers Bulletin (1975) I.G.F.R.I. Jhansi

10. Forage Crops in India by T.R.Narayanan & P.M.Dabadghao

11. Annual Report (1972 - 74) I.G.F.R.I. Jhansi

12. Annual Report (1972) pp.1 - 4

13. ibid. p. 81

14. ibid. p. 81

CHAPTER V

LIVE-STOCK AND THEIR NUTRITION.

STOCK IN BUNDELKHAND AND ITS ECONOMY:

CHAPTER V

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CHAPTER V

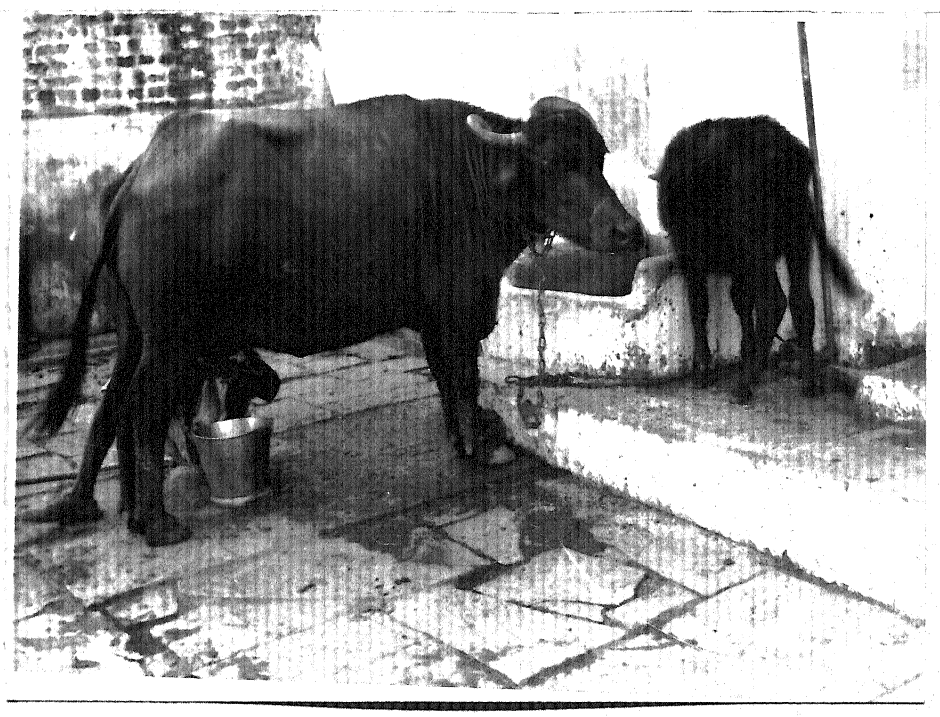
LIVE-STOCK AND THEIR NUTRITION.

1. LIVE-STOCK IN BUNDELKHAND AND ITS ECONOMY:

Bundelkhand region has a large number of live-stock out of which some are domestic, some are non-descripted and few are registered.

Although Bundelkhand is a very backward circle in Uttar Pradesh, yet the live-stock population of this area is biggest. The total live-stock population dif Bundelkhand is about 40 lakhs, and of which the cattle population is 21.69 lakhs, buffaloes population is 6.58 lakhs, goat population is 6.97 lakhs and sheep population is 1.87 lakhs. Apart from this one lakh sixty two thousand poultry birds are found. For the greater part of the year, the cattle have to subsist on stunted shrubs and lourste grasses. The area under fodder crops is negligible.[1]

DOMESTIC ANIMALS



Without best live-stock, Bundelkhand agriculture cannot be developed, because in this region ploughing per is very less, because methods of cultivation are old and bullock carts are used for sending the product from the farmer's to the market.[2]

LIVE-STOCK IN JHANSI: District Jhansi is an agricultural city. So live-stock plays an important role in agriculture. According to the census of 1978-79 the position is given as follows :-[3]

Sub-Division	Ploughing bullock	Animal buffaloes	Total	Average per family
1	2	3	4	5
1	2,00,796	15,658	2,16,454	2.5

After giving many facilities, the live-stock of this district are of lower quality. Animals are maintained by old method, Kutri is not given in small pieces. From March to July animals are left free. Owing to these reasons the average milk production per cow and buffalo is about less than one kilogram.

The climate of this district is good and is helpful in the nourishing of Tharparkar cows and Madhawari buffaloes. Thus the quality can be developed.

The keeping of sheep and goats is a good business and the poultry supply the eggs.

LIVE-STOCK IN JALAUN: For feeding purposes and the development of economic standard, live-stocks play an important role. For their development, quality development centre, disease control and fodder developments etc. are working. Animal husbandry is not developed as a separate economic business. It is the complement of agriculture. According to the census of 1972 the total live-stock population was 5,14,511 out of which 1,44,719 were milching, 1,14,729 were non-milching, 1,16,611 were sheep and goats and 1,35,542 were other animals[4], while in 1979-80, 73,243 were buffaloes, 1,39,070 were cows, 1,43,720 were sheep and goats and 16,919 were other animals.

In this district milk, wool and meat productions are on private business.

LIVE-STOCK IN HAMIRPUR: The live-stock which is found in this district are mostly local and of lower quality. They do not supply milk according to the demand per unit. The milk production of cow is 1/2 kg. per day and that of buffalo is one kg. per day.

According to the census of 1971, the live-stock population is given as follows:- [5]

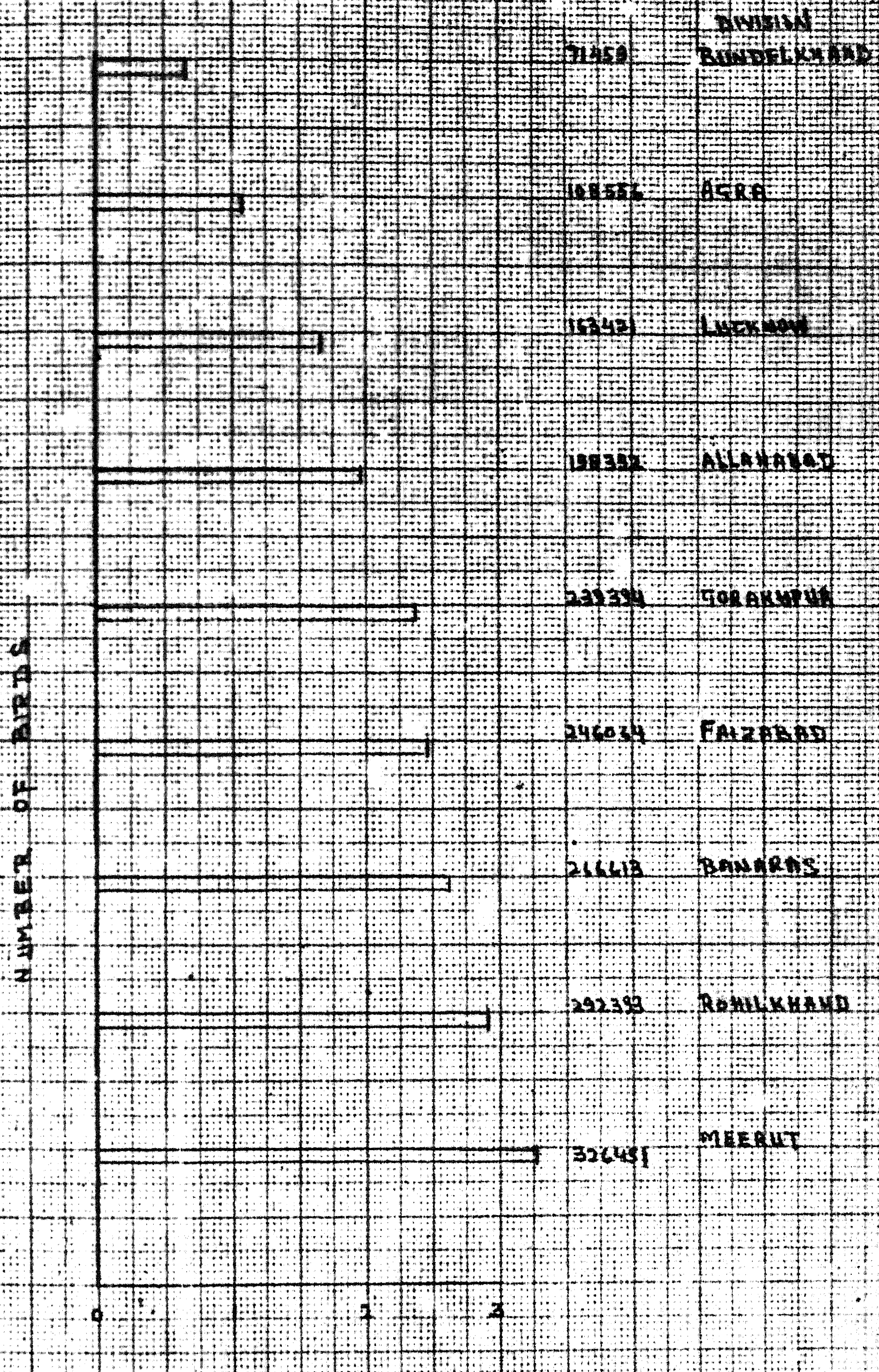
Ploughing animals	2,23,115
Milching animals	2,24,573
Goats	2,30,112
Sheep	48,864
Pigs	20,120
Poultry	28,300

For the development of the region production should be increased by new modern instruments and development of live-stock is also necessary.

LIVE-STOCK IN LALITPUR: Live-stocks are of lower quality in this district. Animals are dwarfish and give lower quality and quantity of milk.

In this district total live-stock population is 6,44,000, out of which 1,55,000 are milching like cows and buffaloes and 1,58,000 are goats, sheep and non-milching animals.[6] Thus this district is rich by live-stock. In this district average per unit milk production of cow per day is 0.500 litre and that of buffalo is 1.500 litre.[7]

POULTRY FARMING



SCALE - 1CM = 50000

LIVE-STOCK IN BANDA: It is a hot area. So, the death rate is high. The cattle are of the poor quality. In the sub-divisions I and II, mostly local cows and buffaloes, graded cows and Bhadawari buffaloes are found. The milk production of local cows is 2.4 litres per day. Average milk production of buffaloes is 3. 5 kgs. per day.[8]

According to the census of 1972, there were 6,60,000 cows, 2,33,000 buffaloes, 235 goats and 25 others.

The main products which are obtained from the cattle are leather, bones, milk and wool. The wool production of graded sheep is 1.1800 qr. and about 75,000 kgs. leather is obtained per day.

Chillaghat and Pajapur are the main fish centres of Banda district.

ECONOMY: Animals play a very important role in rural economy. Bullock carts are used in sending the agricultural products., from villages to the market.

From the ancient times the animal husbandry is related to economic status of the village areas and equally of the farmers but the animal owners of Bundelkhand are

still backward because milk producing capacity of animals found in this place is very little. This is due to the fact that most of the land of this region is sandy and rocky and the irrigation facilities are also very limited. The conditions of the animals are also very pity.[9]

In the present economy in order to augument food production and effect an agricultural development it is necessary to bring development to the standard of farmers and development of live-stock. The development of live-stock is not a separate issue but it is the component part of the agriculture complex.

People, having less income, always suffer from many difficulties. They cannot fulfil the wants of their family. There ever is a problem of food, clothing and illness. This problem is not only for a small minority but one for 80 – 85% people of the Indian society.

The keeping of buffaloes and cows and selling of calves and milk can be a good business for those farmers who have no more land and cannot earn money from grain crops. They atleast can solve their problems by selling of milk and its by-products in the meantime of sowing and

harvesting.

Life of man is directly or indirectly dependent on animals. Cows and buffaloes are a source of many life giving products to the vegetarian people. Although the main product is milk yet the by-products of milk like ghee, khoya, butter, cheese and dahi are also a great gift. The price of a murah buffaloe in Banda is about Rs.2,500/- to Rs.3000/-, because this type gives 200 kgs. milk after one pregnancy. For purchasing this loan is also given by banks on interest.

The production of milk depends upon the maintenance and feeds of milching cattle. A buffaloe which gives 8 kgs. milk requires 10 kgs. green fodder, 8 kgs. bhusa and 1.5 kgs. concentrates.

Cost	First Year	Second Year	Third Year
Feed	550	550	550
Bhusa	600	600	600
Green fodder	360	360	360
Production diet	900	900	900
Pregnancy diet	60	60	60
Disease cost	30	30	30
Total	2500	2500	2500

One buffalo gives 2000 kgs. milk per year out of which about 200 kgs. for calf and 1800 kgs. for selling.

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Income:

		First Year	Second Year	Third Year
(1)	1800 kgs. Milk (Rate Rs.2000/kg)	3600	3600	3890
(2)	Fertilizer	78	78	78
(3)	Selling of Parwa	..	..	..
	Total	3678	3678	3968
	Profit per year	1178	1178	1468

Thus, in the first two years the net profit will be Rs.1,178/- which increases in the third year upto Rs.1468/-.[10]

Keeping of goats, sheep, pigs is also a good business. By the selling of milk and kids, lamb etc. a good income may be earned. Two kids are given by a goat in one year. Goat milk is very suitable for children because in this milk granules are in small sizes and in little quantity in comparison with the milk of cow. This milk also contains large amounts of phosphorous and iron. Then there is a great demand of kids for their meat. Goats residue is used for making a good quality fertilizer. The average cost of a goat is about Rs.300/- including transport cost. For

showing the economy of goat a table is given below.[11]

Good income may be also earned by sheep business. The sheep provides meat and wool. Fertilizer is formed by excreta of sheep. Many farmers arrange sheep on their farms. Wool is produced twice in a year.

Pig business may be started by keeping two bigs only. The cost of one female pig is about Rs.300/-.[12] Thus their keeping does not require a heavy capital. Then they multiply at a very vigorous rate. One sow furrows five at a time. Thus, there is a rapid increase in the wealth.

2. CLASSIFICATION OF LIVE-STOCK, THEIR BREEDS AND BREEDING POLICY:

Although Bundelkhand is a backward area yet it is rich in live-stock population. Many types of animals are found in this region, such as cattle sheep, goats, pigs, poultry and fisheries.

In our country of the total live-stock population 52% are cattle (cows and buffaloes).[13]

Cattle are classified in three qualities :-

(i) Milching

(ii) Non-milching

(iii) Both milching and non-milching.

Profit of Goat

C o s t

). of)ats.	Kids	Feed	Medicine	Total cost
Goat	3	600	30	630
Goats	5	950	60	1010
Goats	10	1900	140	2040

I n c o m e

o.of oats	Selling of milk	Male	Female	Rejected	Fertilizer	Total income	Profit
1 Goat	180 Lt. 540 Rs.	1 210 Rs.	1 480	..	100	1330	700
2 Goats	360 Lt. 1080 Rs.	2 420 Rs.	2 480	1 120	220	2280	1300
3 Goats	720 Lt. 2160 Rs.	4 960 Rs.	4 960	1 120	450	4530	2490

The above table shows that keeping of 3 goats is more profitable than one or two goats.

<u>MILCHING CATTLE</u>: Cows and buffaloes of this quality give large amounts of milk, but they have very low power of carrying on agricultural work. The qualities are Gurs, Sindhi, Sahibal and Devni. But in Bundelkhand Sahibal qualities are mainly found.

<u>NON-MILCHING</u>: The cows give very little quantity of milk They are useful for providing bullocks for carts and ploughing. The main quality is Kankate. [14]

Although the population of buffaloes is less than cows but about more than 50% milk is produced by buffaloes. The main qualities of buffaloes are Mura, Mehsama, Surti and Nile. Out of these mainly Mura and Malvari are found in Bundelkhand region.[15]

Goats and sheep also play an important role in live-stock as non-milching agents. The goat business is very cheap. It requires only physical labour of men.

The main qualities of goats are Jamunapuri, Barvari and Bangali. Out of these qualities only Jamunapuri and Barwari are found in Bundelkhand region. Animal population according to the census of 1972 is given in the table.[16]

S.No.	Name of animals	No. of animals
1.	Bulls and bullocks	1,34,159
2.	Cows	1,15,075
3.	Calves	1,04,572
4.	Buffalo calves	31,842
5.	Buffaloes	51,890
6.	Sheep	53,020
7.	Goats	1,28,223
8.	Horses	1,738
9.	Pigs	6,049
10.	Camels	66
11.	Others	506
12.	Poultries	40,531

DISTRIBUTION OF LIVE-STOCK IN JHANSI: The number of cattle in Jhansi has considerably increased during the last 50 years, [redacted]. The total number of cattle was 5,27,718 in 1920 which, in 1930, reached the figures of 6,97,155. There was a considerable change in their number in the next fifteen years. In 1954 it was 6,49,782 out of which 3,32,411 were male and 3,12,371 were female. The number increased considerably in the next seven years being

3,30,826 in 1951 of which 3,57,266 were female. According to the census of 1956 the number of cattle in the district was 7,25,046 of which 3,77,678 were male and 3,47,368 were female which also included young stock totalling 2,11,182 of the total number of adult male animals which numbered 2,72,039. The working bullocks numbered 2,55,987. The breeding bulls were 796 and the rest were 15,256. The adult cows number 2,41,825 including 2,40,799.[17]

The number of buffaloes has always been lower than that of cows and bulls.

According to the census of 1971 in this district the number of bullocks above 3 years was 1,30,898 and 1,396 buffaloes bulls, out of which 1,28,875 bulbcks and 871 bulls were workable. The number of milching cows and buffaloes were 47,077 and 25,378, respectively, and the number of sheep, goats and pultries were 53,020, 1,28,223 and 40,529, respectively. In the year 1980 number of cows were 1,57,447 and buffaloes were 97,288.[18]

Live-stock population in 1979-80 are given below :- [19]

Cows	...	1,57,447
Buffaloes	...	97,288
Bulls	...	20,00,796
Sheep & Goats	...	1,88,639
Poultries	...	1,307

ANIMAL DISTRIBUTION IN JALAUN: In 1966 animal population was 5,60,000 while in 1972 it was 514.5 thousands. Thus in 1972 it decreased to 4%. In 1972 the poultry amounted to 24.5 thousand and the remaining to 1,35,452. Out of total population, 1,47,719 animals were milching and 1,14,729 were meant for ploughing. In this district there are no poultry farms. In 1977-78 there was a target of distribution of 1,26,000 poultry farms.[20]

Live-stock population according to the census of 1979-80 was as given below :-[21]

Cows	...	1,37,070
Buffaloes	...	73,243
Sheep & Goats	...	1,48,628
Poultry	...	16,919

DISTRIBUTION OF ANIMALS IN BANDA: Banda is a hot district. So, the death rate of the animals is high.

In 1972 about 3 years age number of milching animals was 3,58,000 and non-milching and ploughing animals were 2,61,000, 20,630 goats, 2,85,000 sheep and 30,000 poultries.[22]

Live-stock population according to the census of 1979-80 was as given below :-[23]

(1) Number of milching animals	4,71,085
(2) Number of non-milching animals	2,61,201
(3) Sheep and goats	2,70,664
(4) Poultries	29,531

ANIMAL DISTRIBUTION IN HAMIRPUR: According to the census of 1971 live-stock population was as given below :-[24]

(1) Non-milching animals	2,23,115
(2) Milching animals	2,24,573
(3) Goats	2,30,112
(4) Sheep	48,804
(5) Pigs	20,120
(6) Poultries	38,300

Animal population in 1979-80 was as given below:-[25]

(1) Buffaloes	58,039
(2) Bulls	2,29,594

(3) Cows above 3 years	...	1,59,699
(4) Cows below 3 years	...	1,58,694
(5) Sheep and Goats	...	2,87,399
(6) Poultries	...	72,715
(7) Others	...	32,775

DISTRIBUTION OF LIVE-STOCK IN LALITPUR: The quality of animals is poor. They are dwarf in size. Therefore, they are unable for work. According to the census of 1971[26] and 1979-80[27] their figures were as given below :-

	1971	1979-80
Cows	39,413	1,52,344
Buffaloes	88,199	13,346
Bulls	1,51,400	97,996
Sheep and Goats	1,82,900	1,43,726
Poultries	15,200	26,301
Others	2,330	2,953

BREEDS AND BREEDING POLICY: In Bundelkhand four districts breed the cattle viz. Haryana, Ponwar, Tharparkar and Kanketa are found. The cattle which did not belong to any of the above four breeds and grades can be classified as non-descripted animals. Haryana, graded Haryana and

non-descripted cattle are found in all the districts of Bundelkhand region.[28]

The percentage distribution of different classes of animals, according to the breeds is present in tables 10-A, 10-B and 10-C.[29]

Table A for milch cattle reveals that for the region as a whole Haryana accounted for 3 per cent while graded Haryana and non-descripted were 49.7 per cent and 47.30 per cent, respectively.

The percentage distribution of workable bulls and bullocks was less than that of milching cows.

It is interesting to note from table 10-C for young stock that in the region as a whole Haryana was 52 % non-descripted was 64 % as compared to 49.7% and 47.3 %, respectively, in the milch cows. This shows an improvement in breed and composition of young stock over the milching cows. In respect of buffaloes the percentage of the distribution of different classes according to breeds are also recorded. It was observed that 1.2% of milk buffaloes were Murah breeds while 44.8 % and 51.4 % were graded Murah and 81.4 % were non-descripted. In case of buffaloes also the

Percentage Distribution of Cattle according to Breeds in Rural and Urban Areas.

TABLE 'A'

CLASS MILCH COWS

Breeds	Area		
	R	U	C
Haryana	.3	.1	.3
Graded Haryana	50.8	42.0	49.7
Ponwar	..	..	..
Graded Ponwar	..	.5	.1
Tharparkar	..	.1	0.0
Graded Tharparkar	.9	.4	.4
Kankatha	.2	.2	.1
Non-descript	46.0	57.0	47.3
Others	1.7	..	1.5

Percentage Distribution of Cattle according to Breeds in Rural and Urban Areas.

TABLE 'B'

CLASS WORKING BULLS AND BULLOCKS

Breeds	Area		
	R	U	C
Haryana	.8	..	.7
Graded Haryana	57.6	56.0	57.5
Ponwar	..	..	..
Graded Ponwar	..	..	..
Tharparkar	0.1	..	0.1
Graded Tharparkar	.9	.8	.9
Kankatha	.2	1.9	.3
Non-descript	40.2	41.3	43.3
Others	.2	..	.2

Percentage Distribution of Cattle according to Breeds in Rural and Urban Areas.

TABLE 'C'

CLASS YOUNG STOCK.

Breeds	Area		
	R	U	C
Haryana	.2	..	.2
Graded Haryana	53.1	49.0	52.0
Ponwar	..	..	..
Graded Ponwar	..	..	..
Tharparkar	0.0	..	0.0
Grader Tharparkar	.5	.9	.6
Kankatha	.1	..	.1
Non-descript	44.8	57.2	46.0
Others	1.3	..	1.1

percentage of non-descripted has been maximum.

It would be seen for young stock that 48.6 % of young stock were of graded Murah breed and 49.3 % were non-descripted which showed slight improvement over the distribution of milk buffaloes.

For increasing the milk production and better health of animals which prophylactic measures treatment and breeding policies are taken with the help of many societies. The live-stock development and white revolution can be achieved by the distribution of developing animals. Animal breeding policies and artificial insemination work, treatment of diseased animals, castration of non-descripted animals, vaccination of animals have been done all these years.

Animal breeding for the purposes of bringing the white revolution is undisputed. Under this important scheme three key village-regions, 7 artificial insemination centres, 12 sub-centres are working in Jhansi and seven banks have also been established at Bharai farm from where the semen of high and good quality is collected and sent to other centres.[30]

Apart from this, 8 natural breeding centres are also working and the part of the district where these facilities are not available, the cows and buffaloes, bulls are working natural service in the district. During the year 1979-80 the cows and buffaloes had been inpregnated by the artificial insemination.

3. FOOD HABITS OF LIVE-STOCK AND ALTERNATIVE FEEDS:

While doing complete enumeration of live-stock in the selected villages the information has been also recorded. This includes the animal only grazed and the animals only staff fed , then the animals both grazed and stall fed.

On the day of visit it was observed that the percentage of animals which were grazed only or stall fed only, is much different between rural and urban areas even for the same classes of animals in the same season. In the rural areas the percentage of stall fed animals was maximum in winter season, but in urban area it was minimum in summer season. But for animals kept on the grazing only the percentage for urban area is much less as compared to rural areas. On considering these practices for different classes of cows and buffaloes, it was observed that for

milk cows, the percentage of the stall fed animals varied from 12 to 20 % in the rural areas and 15 to 30 % in the urban areas.

61 to 80% working bulls and bullocks in cattle in urban and 46 to 56% in rural areas were found to be stall fed. The corresponding percentages for working buffaloes, bulls and bullocks were 13.22% to 89% for urban and 71.87% in rural areas.[32]

PER CAPITAL DAILY SUPPLY OF FEED: For working out the per capita daily supply of feed, the information in regard to animals which had actually received the feed on the day of visit and also the number of animals which had not received the particular food has been utilised.

It is observed that in the rural areas in summer season, a cow in milk receives an average 1.88 kgs. of green fodder, 5.36 kgs. dry fodder and 0.36 kg. of concentrates daily. The correspondibg estimate in respect of buffaloes in milk of the same area and for the same season were 2.53 kgs. of green fodder, 7.3 kgs. of dry fodder and 0.48 kg. of concentrates. Thus, it is clear that per capita supply of feeds to cow in milk is less than that of buffaloes in milk. This is true for urban areas also.

It is also evident that per capita supply of feed to cow in milk or to buffaloe in milk is higher in urban area than that in rural area. The same is for rainy and winter seasons also except that the supply of green fodder is more than that of dry fodder during these seasons. The supply of roughages to cows is about the same as to lactating cows but supply of concentrate is less in comparison in lectation cows. Per capita supply of feed to working bulls and bullocks in rural area is slightly more than that to lactatin cows. In urban area, supply of green fodder to bulls and bullocks in summer season is less than that to the lactating cows as in other season. The reverse is true. In the case of buffaloes the supply of roughages to buffaloes bulls and bullocks is less than that to the lactating buffaloes. Among the lactating buffaloes urban animals are supplied more green fodder in all the seasons. Supply of fodder to young stock is less in rural areas than in urban areas except for green fodder to cattle young stock, 1 to 3 years of age during summer season which is slightly less in urban areas.[33]

AVERAGE DAILY CONSUMPTION OF FEED: In working out the

average daily consumption of different types of feeds and the total number of the animals which had received that particular feed have been used.

It is observed that animals which were both stall fed and grazed, received less roughages and the concentrates than those animals of the same category which were staff-fed. Only a few exceptions to those are observed when comparison is made on the basis of dry fodder and green fodder separately. On the whole, cattle and the buffaloes in urban areas are fed more roughages and concentrates than their counterpart in rural areas. In summer season however young stock in urban areas get less green fodder as compared to their counterparts.[34]

PLACE OF GRAZING: The table given below shows the percentage distribution of households according to place of grazing to which the cattle and buffaloes belonging to the households are sent for grazing in different seasons.

About 41% of the rural and the urban household send their animals to graze on harvested and fallow land in summer season. This percentage runs as follows :-

CATTLE GRAZING

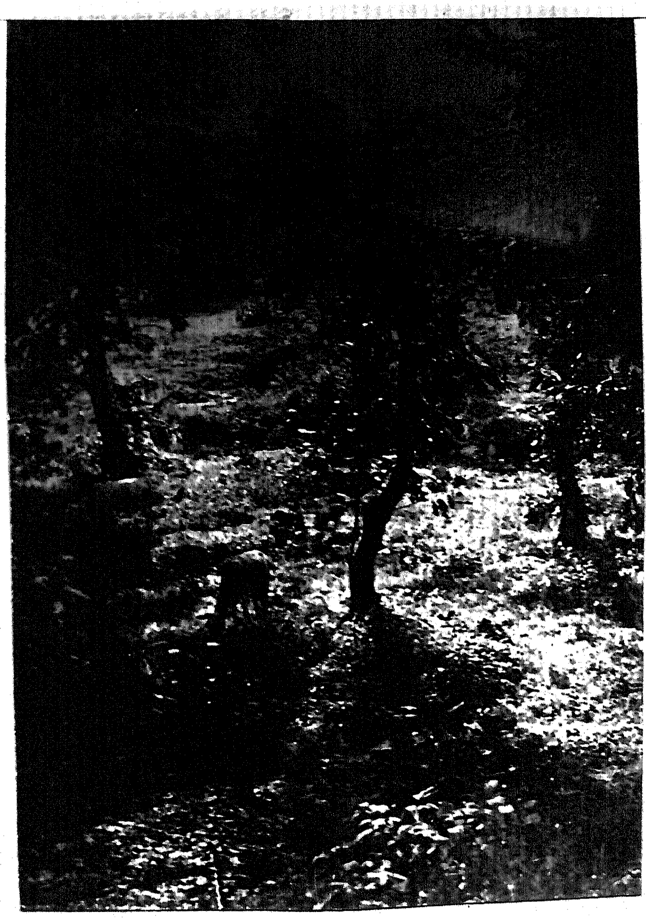
Place of grazing	Summer	Rainy	Winter
1. Harvested & fallow field	4.29	30.01	14.98
2. Common grazing land	23.57	30.65	37.42
3. Banks of river, canal near railway line etc.	6.37	4.71	16.26
4. Forest	21.32	26.17	26.60
5. Unspecified places	7.45	8.46	3.74

About 15% of forest and common grazing land providing grazing in winter to animals of about 28% and 37% of the household respectively.

Average daily hours of grazing have been worked out separately for grazed only and grazed plus stall-fed animals of different categories in different season. There was practically no difference in average grazing hours in different seasons. The difference between animals of same category which were grazed and grazed plus stall-fed were more or less one hour in each season. Working bulls and bullocks were allowed less time to graze as compared to other categories of animals.

A cross breed cow giving an average yield of 2000 kgs. per year will need a minimum of 40 kgs. green

CATTLE GRAZING



fodder consisting of two parts of cereal and one part of legumes, 3 kgs. dry fodder and one kg. of concentrate mixture, 20 million tonnes of green fodder and 7.30 million tonnes of concentrates and 21.9 million tonnes of dry fodder. Equal quantity will also be needed for the young stock, therefore the total quantities for the entire herd of the crossbreeds also will be 58.4, 43.8 and 74.6 million tonnes of green, dry fodder and concentrates mixture, respectively. Apart from this provision for the remaining equivalent 187 million cattle adult units of all types of live-stock has to be made at the minimum rate of 10 kgs. green fodder, 5 kgs. dry fodder and 0.5 kg. concentrates mixture which works out to 682.6, 34.13 million tonnes, respectively. Thus the total requirement for the entire live-stock works out to 1266.5, 385.0 and 48.73 million tonnes of green, dry fodder and concentrates, respectively. We have, therefore, to exert hard to produce additional 929.5 million tonnes of green fodder and 755.49 million tonnes of dry fodder.

It is found that the digestibility of refused feed (from each animal) was slightly lower than that of the corresponding feed offered with advancing maturity, a progressive decline is found in oat. The dry matter

digestibility decreases from only boot to drough stage. The quality of fodder oat is good on early boot stage.

The result shows that the quality of fodder oat is slightly affected by both the conservation methods and greater deterioration was noticed when oat fodder was observed as silage.[35]

4. FODDER AND GREEN FEED AND THEIR MODE OF PROCUREMENT:

Fodder denotes plants used for feeding domestic animals that are reared on a farm, namely cattle, buffaloes horses, sheep, goats, pigs and poultry. The term includes wild as well as cultivated plants that are used as stock feed. The term fodder in the context of feeding live-stock and grassland agriculture is not limited to the botanical sense alone but also includes their common associates of the legume family. Soiling crops are green forage crops that are cut and fed in fresh condition to live-stock.[36]

Apart from the better health the green fodder should be given to live-stock for the increased milk production. Green fodder is available throughout the year to the bovine of only 14% households in rural areas and 20% of households in urban areas. The remaining households can not provide

green fodder during some part of the year. In rural area only 75% of the household can provide fodder to their bovine during the rainy season. There is a corresponding variation in the case of urban household, providing green fodder to their animals.[37]

Shortage of green fodder in different months has also been studied. About 28% of the households of rural areas in summer season report that green fodder is not available in the months of May and June. The corresponding estimate for urban areas is about 29%.

PRODUCTION AND PROCUREMENT OF FEED: In respect of each of the selected households, detailed information about the nature of feed has been collected. The enquiry takes into consideration the production of common feeds given to the animals and the mode of procurement of such feeds viz. whether it is home grown or purchased or both home grown and purchased.

In case of green fodder, it is interesting to note that 43.5% and 38.9% of the households of rural and urban areas respectively, reported that green fodder like leaves, grass etc. are obtained free. In the classification of

household in respect of the procurement of green fodder only those households which do not collect feeds free have been considered. It has been seen that in rural areas the fodder and dry fodder are home grown, their percentage is 97.5 and 91.6, respectively. The corresponding estimates for urban area are 90.8% and 67%. Only 2.4% and 6.6% of the households of rural area report that green and dry fodders are purchased but the corresponding estimate for urban area is 9% and 31.30%. The remaining households grew and purchased both green and dry fodder in rural and urban areas. In case of dana (chuni) the percentage of households in rural and urban areas has been reported to be 83.7 and 43.9.[38]

In Jhansi at this time the fodder which is given to live-stock is dry and broad in which amount of nutritive value and protein is negligible. High quality fodder is produced only on 98 hectares land. In the Five Year Plans there was the target of increasing the area under fodder cultivation. For this purpose seeds are sold on lower price.[39]

At present only one Fodder Reaearch Institute is working in Jhansi.

5. GREEN VEGETATION, PASTURES, GRASSLAND DRY LANDS AND THEIR MANAGEMENT: Since it is investigated that every town and city with a population of one lakh and above is to be covered with milk scheme to meet the requirements of urban population, it is necessary to develope milk colonies around these towns for economical production and speedy transport of milk. In such a programme irrigation development of the areas, seed multiplication and intensive cultivation of fodder crops should be undertaken. One such relation consisting of three plot system developed at the National Dairy Research Institute, Karnal provides for a permanent plot of lucerne intercropped with napier, second plot of two to three crops of maize. Cowpea is followed by oats, mustered, turnip and other plots of hybrid napier intercropped with MP Chari + Sweet sudan + cowpea in the summer season and berseem + mustard + oat in the winter season. This relation ensures steady supply of 240 kgs. green fodder per acre through the year, sufficient for the three cows and three young stock. Green vegetation which is essential for the health of men as well as animals is not upto mark in Bundelkhand. Vegetables are generally available in adequate quantities but they have to be arranged

from outside the region. For the supply of vegetables it has been hit out that atleast an additional area of 1,500 hectares may be put under green vegetation programme.

Kitchen gardens also play an important role in vegetable production. It is proposed to establish 900 additional kitchen gardens in this region along with 939 kitchen gardens already established making the total of 1839.[40]

PASTURES: Pasture is the natural feed for dairy cattle and in many respects the abundance of good pastures provides most of the requirements of a dairy ration for economic production of milk. 35% of the total feed of live-stock is in the form of pastures. The pastures should be supplemented with fodder if the maximum production is to be obtained.[41]

A pasture so as to be of the greatest benefit to the dairyman, must possess the following desirable characteristics :-

(i) YOUNG AND GROWING: The best pasture is a young pasture and in order that it remains good, it must be kept actively growing. If the pastures are soft and tender they are more digestible than old pastures. They also contain all the vitamins. But as the plant becomes old the

quantity of vitamins decreases.

(ii) DENSE AND ABUNDANT: The pastures should be dense and soft as this determines the amount of feed that will be available for the cattle.

(iii) THE PROPER HEIGHT: It is seen that the cows are able to harvest the pastures best when it is 6 inches tall. If they are shorter they cannot get much at one bite. When it is taller the grazing is done by biting into sward to the depth of 4 or 5 inches.

(iv) PALATABLE AND DIGESTIBLE: The digestibility and palatability of the forage will determine the amount of feed that the cows will consume and how much they will be able to convert into milk.

(v) WELL WATERED: The importance of water in pasture during the hot dry months can not be over emphasized. Cows require a large amount of water at every time and in hot weather this requirement is increased greatly. If there is no stream in the pasture, fresh water should be provided by other means.[42]

According to the nature of plant, pastures may be classified in four types :-

(1) PERMANENT PASTURES: This is one of the most economical feeds available for dairy cattle. It requres very little labour and care. Although pastures must be fertilised at intervals yet do not require so much fertiliser as cultivated crops.

(2) SPECIALIZED PASTURES: Dairymen in practically every dairy section are growing specialized pasture crops and treating them more like their main crop. Pastures used in these intensive programmes must receive heavy application of fertilizers and be managed differently contrasted with the usual permanent pastures.

(3) TEMPORARY PASTURES: A temporary pasture can be stored only for one year. On account of large amount of work, necessary to prepare the field and to sow the seed. This type of pasture has not been used extensively in the past but at this time it is widely used.

(4) WINTER PASTURE: Winter pasture includes those crops which relate to early spring grazing.

In Bundelkhand there is large area under grazing and pasture system. Unfrotunately these are not sown pastures. So, these lands provide only coarse grasses full

of weeds and bushes and toxic plants. During the rainy season to prevent the animals from death, an application of 20 to 30 kgs. nitrogen and 10 - 15 kgs. P_2O_5 per hectare should be applied to the sown pastures. So, the first few showers will considerably improve the fields and the quality of grasses. Deferred rotational grazing system should be followed and surplus quantity of grasses should be harvested at the proper stage and conserved in the form of hay and silage.

DRYLANDS: Drylands are traditionally the centre of live-stock farming. The grass never completely fails like the other grain or cash crops. The drought and heat tolerant grasses and trees provide forage for cattle and goats in particular form. A light dose of fertiliser and urea in the form of foliar spray after a shower of rains brings about an appreciable increase in the productivity of the grass cover in such regions, grass crops alternating with other grain and oil seed crops and a large number of drought tolerant grass and legume species such as Sindicus, Conchrus, Centigerm, Dichanthium annulatum.[43]

Dry farming plot project scheme was initiated in

December in Lalitpur and Jhansi as these districts have little irrigation and topography eneven. The various findings of research on water and soil conservation improved dry land agriculture were tested and adopted in field scale in the area.

The following salient recommendations have been successfully tested and adopted by cultivators :-

(a) Deep ploughing and mend bundhies have resulted in moisture conservation and better yield.

(b) Terracing and contour bundhies have helped in soil conservation.

(c) Water harvesting bundhies had checked flow of water which was stored and used for irrigating Rabi crops.

(d) Crops and varieties suitable under dry farming were introduced such as Jowar Mau T-1.

(e) Soil conservation programmes were adopted in 1225 hectares and 31 water harvesting bundhies, 113 pumping sets.

(f) Foliar spray of urea was done to improve crop yields. Basal placements of the fertiliser will be tried this year and more will be brought under dry farming.[44]

GRASSLANDS: Bundelkhand region has enormous live-stock population but they are unable to solve the problem of protein contents. Besides other factors, one major reason for the low productivity and poor performance of our live-stock is the factor of malnutrition, under nutrition or both.[45] It is estimated that about 90% of animal population subsists on natural grasses that are available inside and outside the forests.

ESTABLISHMENT OF 'INDIAN GRASSLAND & FODDER RESEARCH INSTITUTE'.

The importance of grasses, grasslands and fodder crops in feeding the live-stock and in agricultural economy the increasing gap between the supply and demand of forage, the limitation of grasses' studies and the diversity and complexity of the problems led to the establishment of the I.G.F.R.I. towards the end of the Third Five Year Plan by the Government of India and administered from April 1966 by the Indian Council of Agricultural Research, New Delhi.[46]

The position of grasslands in Bundelkhand is given as below :- [47]

Region	Unit	31.3.69	31.3.74	31.3.75	31.3.76	31.3.80
Hamirpur	Ha.	0-520	0-535	0-536	0-514	445
Lalitpur	Ha.	7	6	6	6	721
Banda	Ha.	0-1	0-1	-	-	58
Jhansi	Ha.	7	1	-	-	976
Jalaun	Ha.	-	-	-	-	269

The management of grassland includes grazing management of improved in such a way that the grassland is maintained at the optimum stage of production and also bring about efficient utilisation of the forage produced. It is also concerned with the establishment, utilisation of cultivated grasslands with the view to bring about efficient use of marginal and sub-marginal lands for animal production.

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CHAPTER VI

LIVE-STOCK FEED TECHNOLOGY

1. FEEDING CATTLE TO SUIT THE TROPICAL ENVIRONMENT:

Standardisation of feeding techniques will no doubt greatly aid to the efficiency of utilisation of straws, a vast but poor quality fodder resources of the region. The bulk of animal population has also to depend on the natural grasslands for their subsistence and it must be conceded that the number of those animals far exceed the carrying capacity of these grasslands which are in a highly overgrazed and deteriorated stage. It is thus obvious that unless serious attempts are made to bridge this gap between the supply and the demand of good quality and quantity fodder, the production efficiency of our animals shall continue to be very low and may even go down further with increasing live-stock population. There is thus a need for the rectification of herbage deficiencies by improving the forage potential of the grasslands on the one hand and

by increasing the area under the cultivation of high yielding and coupled with the adoption of package of modern agronomic practices on the other side.

To develope feeding techniques of Bundelkhand region for cattle in accordance with tropical environment of the region, the cattle feeds have to be so oriented so as to agree with the changing pattern of the climatic conditions of Bundelkhand. It is obvious that once the cattle feed is made available, it has to be preserved in relation to the temperature changes so that they should not in any way damage the feed for the cattle and should preserve and maintain the feed ingredient so that it can be used all the year round. The feed containers should be such so as to avoid damages in the feed and also to eliminate bacterial infection. The feeds should be treated chemically from time to time in godowns and also in cold storages. If they are established in the region whenever cattle feed is made available for the live-stock. It should be as fresh as possible to maintain normal diet for the cattle. Tropical and environmental changes should in no way effect the feeding stock on cattle. The maintenance of feeding

stocks should be on the line as we do in the case of maintaining food stocks for human consumption. There should be well organised agencies to handle cattle feed in Bundelkhand region in order to provide regular feed for infantyle cattle population.

The I.G.F.R.I. recommended fodder oriented animal feeding schedule as far as it is possible. In centre where concentrate ration plays a major role we must henceforth resort to fodder based ration. Some of the delegates pointed out that animals producing 7 kgs. milk daily need not be fed any concentrates ration if they are fed with graminacious fodder at the same rate; animals giving upto 5 kgs. milk can be easily maintained. For high yielding animals additional concentrate feeding may be allowed according to the following schedule.

One kg. concentrate, 18% D.C.P. and 17% T.D.N. per five litres of milk in case of buffaloes and 3.0 litres in case of cows.[1]

The dry matter consumption of oat at Bhari farm bucks varied from 3.26 to 3.42 kgs. per 100 kgs. body weight from pre boot to 10% flowering stage. The dry matter

consumption decreases significant body weight. The consumption of dry matter by a goat was 2.66 kgs. for second cut oat fodder.[2]

The purpose of study is to compare the voluntary intake of roughage when the animals were fed individually and when in groups. The experiment was conducted for six weeks with mature barbari bucks. It was found that the intake of berseem hay was more in group fed animals (2.5 kgs. per 100 kgs. body weight) than that of the individually fed animals. It was also noted that the intake of roughage increased from the first to the third week (1.5 kgs. to 1.94 kgs. in case of group fed animals) and from the second to third week period (2.40 kgs. and 2.60 kgs in individual and group fed animals, respectively, after which no substantial increase was found.[3]

2. TO DEVELOPE FODDER FOR MILCHING & NON-MILCHING LIVE-STOCK:

The intensive milk production programme depends essentially on the supply of high tonnage and high quantity green fodder throughout the year. To achieve this objective a system of overlapping cropping is developed with giving over 2000 quintals per hectare of green fodder, averaging 5.5 quintals per day and thus enabling the maintenance of

12 high producing milk animals under conditions prevailing in Jhansi.[4]

Owing to the shortage of green fodder, the production of milk is less and the nutritive value of milk is also less. Mostly one farmer keeps one or two milching cattle, the average production of milk of these cattle is very less. The main reason of this is the cattle do not get kutri and nutritive green fodder during the year. The farmers can give kutri to their live-stock for the increase in the production of milk but the Indian farmer is so poor that he cannot afford the cultivation cost of kutri.

To develope the fodder production many crop cycles have been suggested by Indian Grassland and Fodder Research Institute, Jhansi. Main crop cycles are given as below :-[5]

Berseem + Sarson → Napier + Cowpea.

When this cycle is followed, the total green fodder yields will be 2,385 quintals/hectare.

<u>VARIETIES:</u> The main varieties which are used in this cycle are berseem igfari 99-1 giant Napier N.V.-23, N.V.-17, Pusagiant, lobia igfari 450 and Japan sarson.

SOWING: The seed rate of berseem is 25 kgs. per ha. and 2 kgs. seed rate of Japan sarson. The sowing of mixed Japan sarson increases the yield upto 50% of the first cut. 2,50,000 piece/ha. of giant napier and 50 - 60 kgs./ha. cowpea seeds are sown.

Berseem is sown in the beginning of October. Before sowing the field is divided into small plots. Seeds are sown by two methods. In the first case seeds are sown before irrigation and in the other seeds are irrigated before sowing.

After the third cutting of berseem, napier grass is sown in the month of February. Subsequent irrigations are applied s o that both the fodder crops may be irrigated at a time.

At the end of April berseem is removed and lobia is sown in between the rows of the napier grass.

MANURING: For the good yield of cowpea 80 - 60% nitrogen per hectare is applied before the sowing.

The good method of manuring is that the soil is tested from Soil Laboratories, but if there are no facilities of soil testing then 50 kgs. phosphorous and

50 kgs. potash per hectare is given to the field. This fertilizer is useful for both the napier and the cowpea.

IRRIGATION: The number of irrigation intervals in winter is 10 days and this interval increases in summer upto 15 days.

Berseem is harvested for the first time after 50 - 60 days. After that many cuts are given. Napier grass is harvested after three months. The cowpea is harvested in the first week of July.

YIELDS: The green fodder yields is given below :-

Fodder	Yield quintal/ha.
Berseem	8,000 - 1,000
Napier grass	1,200 - 1,500
Cowpea	125 - 150

CROP CYCLE NUMBER 2. Berseem + Japan sarson - Maize + Cowpea - MP Chari + Cowpea.

SOWING : Miaze and Cowpea both are sown at the seed rate of 30 kgs./ha. Maize + Cowpea should be sown in the month of April after harvesting the Berseem. These are sown in alternate rows. MP Chari + Cowpea are sown in the last week of July.

FERTILIZER: Maize + Cowpea require 90 kgs.nitrogen/hectare and 20 kgs.phosphorous/ha. Before sowing MP Chari + Cowpea require 60 kgs.nitrogen/ha. and 40 kgs.phosphorous/ha. but after harvesting 40 kgs.nitrogen/ha. should be added.

IRRIGATION: In summer Maize + Cowpea are irrigated at 7 to 10 days intervals but MP Chari + Cowpea are irrigated according to the rainfall.

HARVESTING: Cowpea is harvested in the last week of June but MP Chari + Cowpea are ready for harvest in September.

YIELDS: In this cycle 250 - 300 quintals and 400 - 500 quintals green fodder is obtained by Maize + Cowpea and MP Chari + Cowpea, respectively.

CROP CYCLE NUMBER 3. Berseem + Japan sarzon - Maize + Cowpea - MP Chari + Cowpea.

VARIETIES: The main varieties of the Maize are Ganga 5, Ganga 2, Vizya.

Maize is sown at the seed rate of 30 kgs./ha. and Cowpea is sown at the seed rate of 25 - 30 kgs./ha.

After harvesting Berseem - Maize and Cowpea are sown in the month of April. Maize is sown in one row and Cowpea in other row. When the field is prepared, MP Chari and Cowpea are sown from the last week of June to the first week of July.

MANURING: For Maize and Cowpea 90 kgs. of nitrogen and 20 kgs. phosphorous per hectare should be given. Before sowing for MP Chari + Cowpea 60 kgs. nitrogen and 20 kgs. phosphorous per hectare should be applied and after first cut 50 kgs. nitrogen is again applied.

IRRIGATION: In summer Maize + Cowpea requires irrigation at 7 - 10 days intervals and MP Chari + Cowpea is irrigated according to the rainfall.

HARVESTING: Cowpea is harvested at the end of June and MP Chari + Cowpea are ready to harvest in September.

The green fodder yields obtained by this cycle is given below :-

Maize + Cowpea 250 - 300 quintals/ha. MP Chari + Cowpea 400 - 500 quintals/ha.

CROP CYCLE NUMBER 4.

Jai - MP Chari - Rap

VARIETIES: Jai Kent, Igfari 2688, 3021, flamigold, Rape-snow ball, purple tap, golden ball, red ball and Pusa Kanchan are the main varieties of this cycle.

SOWING: Jai is sown in the second and the third week of October in between rows 25 cms. apart from each other. MP Chari is sown in April. The seed rate of Jai and Rape is 100 kgs./ha. and 5 kgs./ha., respectively.

MANURING: 30 kgs. nitrogen and 40 kgs. phosphorous per hectare is applied before the sowing of Jai and 30 kgs. nitrogen should be given after the first cut. Before the sowing of Rape crop 60 kgs. nitrogen, 30 kgs. phosphorous and 30 kgs. potash per hectare is given to the fields.

IRRIGATION: Jai is irrigated at 12 - 15 days interval.

Jai is harvested after 70 - 80 days of sowing, Rape is ready to harvest after 60 - 65 days of sowing.

YIELDS: The green fodder yields of this cycle is given below :-

Fodder	Yields/quintal
Jai	400 - 500
MP Chari	600 - 700
Rape	350 - 400

3. PROTEIN RICH FOOD AND IMPROVED METHODS OF FEEDING TECHNIQUE:

Cattle can be kept in good health and working condition only if they are fed properly. The food consumed by animals get broken down in their digestive organs into simpler compound that ultimately serve as source of energy.

For the efficient and economic feeding of farm animals, it is essential to know the composition of food stuffs.

Chemical analysis is the first step in the assessment of the nutritive value of any feeding stuff. This analysis shows the propagation of the different constituents It enables us to see whether a given food stuff is rich or poor in protein minerals.

Foodstuffs are of two types :-

(1) Concentrates

(2) Roughages

Concentrates are also divided into two forms :-

(a) Nitrogenous concentrates, containing large quantity of protein

(b) Non-nitrogenous containing very little quantity of protein.

Groundnut is an example of nitrogenous concentrate while oats and maize are non-nitrogenous food.

Roughages are also divided into high protein roughages like lucerne which contains 8 - 10% or more protein than those low in protein, varying from 0 to 1.0% of proteins, for example straws and green fodder like sorghum and guinea grass.[6]

Proteins are utilised in the maintenance of animal body mainly for the production of muscles and ~~to~~ replace physiological losses, wear and tear. They are also utilised in the formation of milk protein and wool protein.

In the analysis of food stuffs, the proteins and non-protein nitrogenous subsistences are determined together as (crude protein) based upon the fact that proteins contain an average of 16% of nitrogen.

The aim of live-stock farmers is to secure a continuous supply of a maximum output and high quality fodder but this is possible under very favourable and strictly controlled conditions. Forage crops show wide

differences among themselves in nutritive value like proteins. In splits of these differences it may be said in general that there is a progressive deterioration in the quality of forage plants with advancing maturity and the percentage of nutritive constituent diminishes with ripening.

Napier grass soon becomes very fibrous and then the cattle do not like it much. Oats are a very nutritive fodder. All constituents in fodder decrease with age but in Sudan grass proteins remain reasonably good. In lucerne protein content also decreases with the age.

Variations in the nutritive value of forage crops:-

Forage crop/stage of growth	Crude protein
Napier grass:	
Young	6.60
Prime	6.12
Ripe	5.92
Oats:	
Young	12.18
Prime	9.63
Ripe	5.69
Sudan grass:	
Young	5.92
Prime	6.00
Ripe	5.41

Forage crop/stage of growth	Crude protein
Lucerne:	
Young	17.01
Prime	13.31
Ripe	11.31

High protein fodder crops which are also highly nourishing ones are berseem, lucerne and cowpea. Of the non-leguminous bajra has higher protein content than other fodders. But being less succulent it is not relished in preference to jowar and maize. Berseem is the richest fodder and mineral content when it is fertilised with phosphate, its phosphorous and calcium content go up very appreciably.

Studies on the Isefema grassland showed that the highest crude protein production however was obtained when grass was cut at interval of 30 days.

The results of a digestibility-cum-metabolism experiment conducted on goats by I.G.F.R.I. have shown that if MP Chari and Cowpea are cut first time at 50% flowering stage, the percentage of disgestible crude proteins was 2.75 and 10.8%, respectively.[7]

The quantity of protein of sorghum at 50% flowering stage is 9 - 13% and protein of berseem is decreased from first to third cut.

4. DEVELOPMENT OF OPTIMUM MILK SUPPLY & DAIRY PRODUCTS IN BUNDELKHAND:

Although some adoption has been made in adoption of crossbreed animals, these cannot produce sufficient quantity of milk, and their genetical potentialities cannot be exploited unless these are given adequate quantity and quality of fodder and feeds. The farmer is unwilling to divert his land from grain cultivation to fodder, apprehending that he will not get sufficient return on milk per unit area of land. It is however necessary to demonstrate to the farmer that the dairy industry can be economically and profitably carried out provided fodder production scientifically managed according to the modern technology of agriculture production. With this objective in view a co-ordinated research project on the determination of the milk economy under varying conditions has been formulated.

Live-stock are the wealth of a nation on which people depend directly or indirectly. Bundelkhand region also contains a large number of live-stock. Bundelkhand agriculture cannot be developed without best live-stock so

the development of live-stock is very necessary. For the development of live-stock many programmes are started for quality development, disease control and availability of green feed by animal husbandry department.

In Bundelkhand milk production is insufficient. The main cause for this is rocky area, less facilities of irrigation, people do not believe on artificial insemination and fodder which is given to animals in dry and broad and contain very little quantity of protein.

For the development of the milk, many societies are working here. The live-stock development and white revolution can be achieved, under which distribution of animals, animal breeding policies and artificial insemination treatment of diseased animals, castration of non-descript anim als and vaccination of animals are done.

In Jhansi averaje milk production is less than one kg. In 1975-78 milching cows and buffaloes were 47,872 and 25,378, respectively. But in 1979-80 the number of cows and buffaloes was 1,57,447 and 97,288, respectively.

For the quality development of cows into tharparkar and buffaloes into Madawari, one breeding centre is working

in this district.

In Five Year Plan there was target of development of 3.5% milk per year. For this purpose the following programmes are started :-

(1) QUALITY DEVELOPMENT: It is the first necessity for the development of milk. It is estimated by National Dairy Research Institute, Karnal that 60% production can be increased by hybrid cattle.

So, attemps had to be done for the development of milk by cross breeding of local cattle with graded cattle for which 60 cows and buffaloes have been taken.

(2) FODDER: The development of milk is also depending on fodder which is given to the live-stock. In Five Year Plan fodder area was increased upto 556 hectares. In Jhansi district a Fodder Research Institute is also working.

The main constraint in rapid increase in milk production appears to be a very little area under cultivated crops, like maize, jowar, bajra, teosint, oat, cowpea, velvet beans, rice beans, guar, berseem and some other grasses like, napier grass, para grass etc. and other short duration crops.

All the regions of Bundelkhand are most suited to the development of the cultivated fodders. The land is very fertile with the lots of irrigation facilities and high intensity of cropping. About 60% of the nett sown area is under cultivated fodder crops. Maximum use of fertiliser is not made particularly in Bundelkhand region.

(3) DISEASE CONTROL: In different Five Year Plans there has been an insistence that in rural area at least nine animal husbandry centres start and 13 cattle hospitals open.

In Lalitpur district recently there has been a proposal of development of milk of 3 - 4% per day. For this purpose, quality development and fodder development programmes are in operation. In this district 15 artificial insemination centres are working.

For the development of milk, the fodder should be digestible and soft. At this time only 23 hectares land is used for fodder. But in Fifth Five Year Plan there was a target of 200 hectares land under fodder cultivation.

In Jalaun district for quality development one cattle breeding farm, 8 artificial insemination centres and 17 sub-centres are working.

For cattle treatment in 1975-76 15 hospitals, 5 'D' class dispensaries and 15 main stock centres are working.

Banda is a backward district, there is a shortage of grass and land and people do not believe on artificial insemination system. Hence, it is not very common. In the Fourth Five Year Plan production of milk was 145 gm. per man which is very less. The shepherds of the district keep animals in the form of side business and possess 5 - 7 cows and buffaloes. But this business is not on a large scale, so production of ghee, milk, butter etc. is very less.

Dairy farming scheme should be started for milk production. In Karvi, Mau and second part of this district dairy farm should be started and processing facilities also be given by which processing milk can be supplied to other areas around the city.

In rural area 51.75% and in urban area 36.39% of total milk production in private and household was converted into ghee, khoya and other milk products like Rabri, Malai, ghee etc. The corresponding estimates for

commercial households in rural and urban areas were 30.01% and 6.71%, respectively. Out of the total production of milk 98% is converted into ghee, 1% into khoya and 1% into other products.

(5) CONTAMINATION OF FODDER FOOD AND SCIENTIFIC METHODS OF PRESERVATION:

Our cattle do not get green fodder all the year round. In rainy season green fodder crops as lobia, guar, maize, jowar etc. can be achieved easily. In this season also in grassland, sufficient quantities of fodder is produced. The problem of green fodder can be solved if farmers preserve this fodder by scientific methods in rainy season because green fodder is not only tasteful but it also gives power to the cattle and contains important vitamin 'A'.[8]

METHODS OF PRESERVATION OF GREEN FODDER:

(1) Hay making

(2) Silage making

Hay is a dry fodder which is after making without any disadvantage, can be kept in godowns. In this fodder moisture decreases from 8 - 15%. Lobia, berseem, rigica

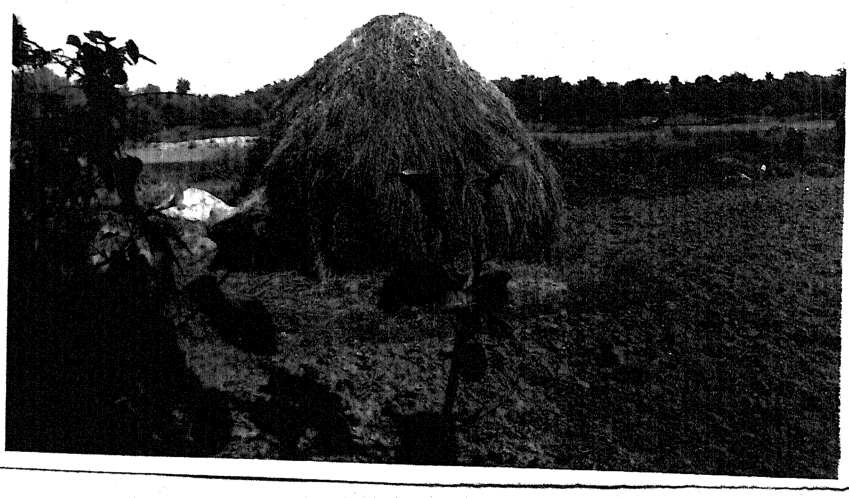
and other broad leaf grasses are useful in making hay. It is observed by Mathura Animal Husbandry College that lobia and jowar are better for hay which contains 22.9% protein.

When hay is manufactured, it is observed that the intensity of sunlight should not be too high as to decrease the quantity of chlorophyl and other nutrients. However, a safeguard should be taken if weather is moistured, because it takes more time in drying and then the fungus also overtakes it. Therefore, the cutting should be done in the morning. After cutting, plants should be kept in sunlight till the evening. Thus the next day there is a possibility that the moisture disappears and the hay is ready.

BERSEEM HAY: An efficient economic method of making good quality berseem hay, has been developed. Galvanised iron woven wire fencing material, which is readily available was utilised for this purpose. The losses of dry matter and labour requirement have been considerably reduced as compared with those involved in the commercial method of making hay on the ground.

TRIPOND METHOD: It is a very common method of hay making. In this method fodder is kept on a frame of banse. In this

FODDER STOCKING ON FIELD



method the fodder should not be pressed. Thus air passes from lower surface. Fodder remains green.

SILAGE: The another method of preservation of fodder is silage making, when fodder is preserved in green and soft form, it is known as silage. The main aims of silage are the following :-

(1) In this method fodder is not only green, soft and disgestible but it also contains sufficient quantity of water like fresh fodder.

(2) If silage manufacturing method is good then it contains more nutrient than fundamental crops.

(3) This is a very chief medium of preservation of fodder in green forms.

(4) Good manufactured silaje can be used upto long time in the same form.

(5) One tonne silage occupies only 1/3rd area of the same quality of Kadvi and Bhusa.

(6) It has no danger from fire like Kadvi and Bhusa.

(7) When green fodder is not available to cattle then silage is used for feeding.

METHOD OF MANUFACTURING OF SILAGE: For making silage, fodder can be present in the form of Kutri or in same forms. Its fodder is pieced in kutri that it can be pressed easily and more of air may be passed. In short places large quantities of fodder may be placed. If kutri is formed after making then it will be difficult. This pieced silage is very useful in emergency period.

METHOD OF PRESSING OF SILAGE:

(1) BURGIFORM SILO: This type of silo is formed on the land surface, rounded durable well of cement brick or soil is formed. The diametre of well should be half of the length. In Burgi of 3 metres diameter and 6 metres depth, about 28 tonnes cutted silage can be filled. But it is very costly method.

(2) DEEP ROUNDED SILO: This method is used when water level is below the land surface. Depth and diameter of the well should be two metres. In this method small pieced bhusa can be kept easily.

(3) TUBUCULAR SILO: Length and breadth of gutter depends on the quantity of fodder needed by live-stock.

52 tonnes pieced silage can be pressed in gutter of two metres length.

Fodder which is used in the form of silage should have 60 - 70% water and 20 - 38% dry matter. After three months of pressing of fodder, silage is prepared. Good silage contains brown or yellow colour. One milching cow and buffalo require 15 - 30 kgs. 20 - 35 kgs. silage, respectively.

6. LIVE-STOCK MANAGEMENT AND NUTRITION:

The man and the cow are the two important factors of dairy farming. The man handling the herds must be a good milcher, he must see the entire job from the standpoint of having herd. Well cared for and managed in a financial way.

A survey of the study of milk yield, breeds and management practice of bovine was carried out during 1962-63 in Bundelkhand region and other districts of Uttar Pradesh. The main object of the survey was to estimate average milk yield and to collect reliable data on feeding and management practice of bovine.[9]

Detailed datas were collected from enquiry from each selected households in respect of the various

management practice, housing, grazing and utilisation of bullock power of milk.

A cow must always be treated kindly to maintain the milk production. She never tolerates beating and rough behaviour. If she is treated politely then man can loosen her in the fields without any trouble. She cannot run away from her caretaker. Man should control his temper. When he is handling gently they will go in and out of the barn with less disturbance and danger.

When cows are housed by the loose housing method, the freedom of movement will suffice. Some herds that are producing well are kept in station barns throughout the winter. Usually they can be turned out for at least an hour or two while the barn is being cleansed.[10]

Percentage of distribution of households according to the type of housing provided for bovine in the different seasons :-[11]

Type of housing provided for bovine	Rural Summer %	Rainy %	Winter %	Urban Summer %	Rainy %	Winter %
1) Pucca houses with						
a) Pucca floors	.70	.23	.16	2.58	6.67	2.80
b) Kachha floors	12.24	14.93	13.13	7.63	14.63	18.20
2) Kachha houses with						
a) Kachha floors	21.62	34.43	44.16	24.85	48.00	51.63
b) Pucca floors	7.79	-	.22	8.98	-	-
3) Tin sheds	.16	.39	44.16	3.93	5.93	51.63
4) Thatched sheds	48.27	43.85	2.04	51.29	27.50	24.83
5) Open spaces	9.22	6.19	39.57	.14	.37	.70

Both in rural and urban areas thatched sheds and kachha houses with kachha floors are provided by about 70 - 84% of the household. The highest percentage of the household preferred to keep their animals under thatched sheets during the summer whereas in kachha houses during the winter only 10 - 21% of households can provide pucca housing facilities for their anim als.

DEHORNING: Dairy cattle should be dehorned. Horned cattle cannot be satisfactorily handled in loose housing arrangement and in milking periods. This practice is declining

fast and the most of the cattle are dehorned. The dehorned cows can be kept together in closer quarters or yards without danger. They can be fed together with more consumption of the feed by all animals.

TRIMMING OF HOOFS: Cows that are kept in the barns for several months often develop long and misshapen hoofs. When on pasture, cows usually keep their hoofs. The hoofs should be trimmed when they are too long or are uneven, otherwise the long toes may break off and cause lameness.

WATERING: The dairy cows must consume large quatities of water for the production of milk. The amount that a cow will drink depends upon the outside temperature, the kind of feeding, the amount of milk which is produced by cow and the clearness of the water. A cow producing 25 to 30 pounds of milk daily and eating dry and succulent feeds will easily drink as much as 100 pounds of water per day. Many dairy men are using automatic drinking cups in their barns.

If the weather is warm, more quantity of water is required. If the feed is of a succulent nature, the cow will consume less water than if she was fed dry feed.

NUTRITION: The condition of live-stock in Bundelkhand is very poor. One major reason of it is the malnutrition of live-stock since we are disproportionately short in practically all the feeds and fodder requirements. It has been estimated that the supply of green fodder is less than one-third of the requirements. This is not surprising as only about 4% of the cultivated area in the region is under fodder cultivation. Further there is little forage conservation to produce nutritious fodder in the off season. The concentrates, besides being expensive, are also in short supply by over 60%. The bulk of the nutrition for live-stock during the greater part of the year is derived from the principal crop residues, namely wheat straw or bhusa and the straw of jowar, bajra, paddy and other millets which are poor in protein, calcium and phosphorous, the essential ingredients for productive and healthy animals. They are also comparatively less palatable and are of low disgestibility.[12]

CHAPTER VI

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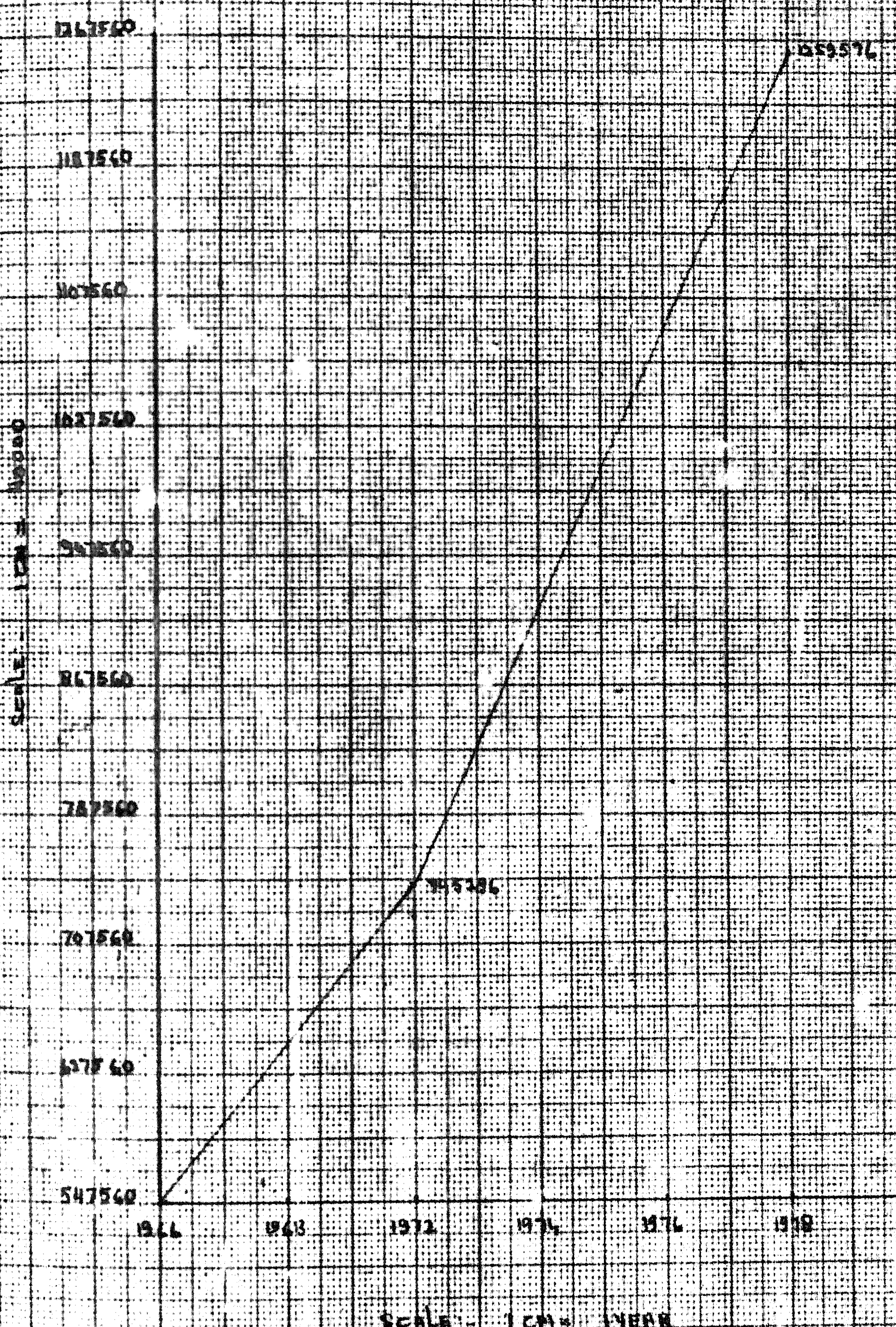
CHAPTER VII

ECONOMIC BEHAVIOUR OF FODDER CROPS:

1. DEMAND FOR FODDER CROPS AS DIET & AS RAW MATERIAL:

Since ancient times fodder is a main diet for cattle, as grain is the base of the life for people. Similarly fodder is the base of the life of cattle. Man requires grain while cattle requires fodder. Although other things are given to the animal yet without fodder animal diet is incomplete. Fodder maintains the health of the live-stock. So, there is a large demand of fodder. India has the largest cattle population, it was 198 millions according to the last census i.e. nearly quarter of the world population. Animal population is increasing year by year. So demand of fodder is also increasing. 50% agricultural income is earned by cattle. For the maintenance of the health of the cattle, quality and quantity of fodder should be good. From many villages the

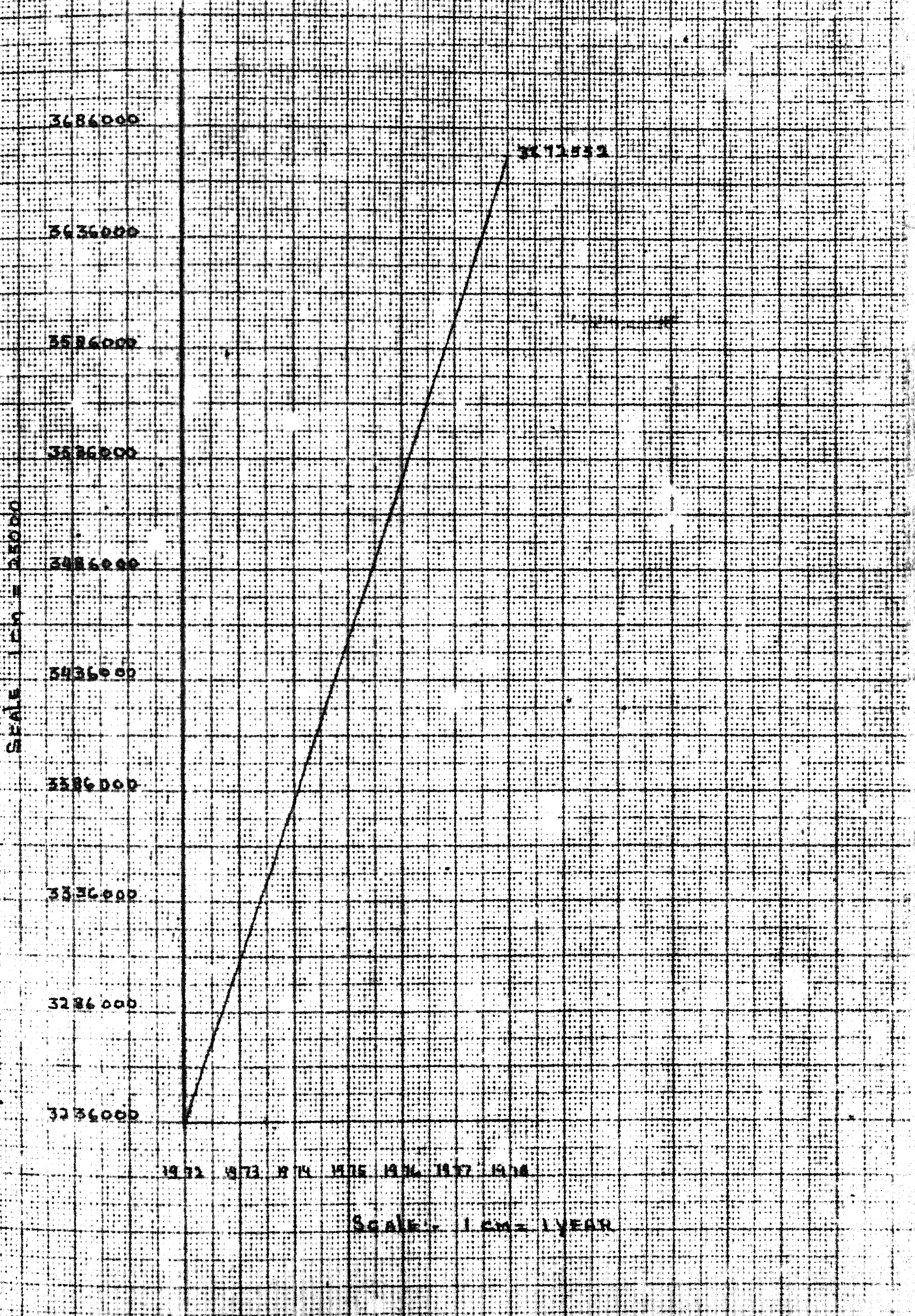
DEMAND OF GREEN FODDER
IN
JHANSI



information has been collected about animals only grazed or only stall fed and it is found that animals which were stall fed and grazed received less roughages and concentrates than those animals of the same category which were only staff fed. Dana mixture and bhusa are also included with animal diet. Thus fodder has never been upto the mark. It has been partial and insufficient for the live-stock.

Live-stock plays an important role in human life. Children's life mostly depends on its products, especially milk. Khoya, Dahi, Cheese, Milk etc. are used by vegetarian people to make up the deficiencies of diet. These things are provided by healthy cattle. Bulls and bullocks are used for ploughing the land and for transportation, wool is obtained from sheep. For all the above purposes the cattle should be healthy which is possible only when good quality of fodder is given to them. It should always be kept in mind that the cost of the cultivation of the fodder is negligible because the fodder does not require any cultural practices. Fodder is cultivated along with grain crops. So, the fodder is the cheapest diet which is

DEMAND OF GREEN FODDER
IN
JALAUN



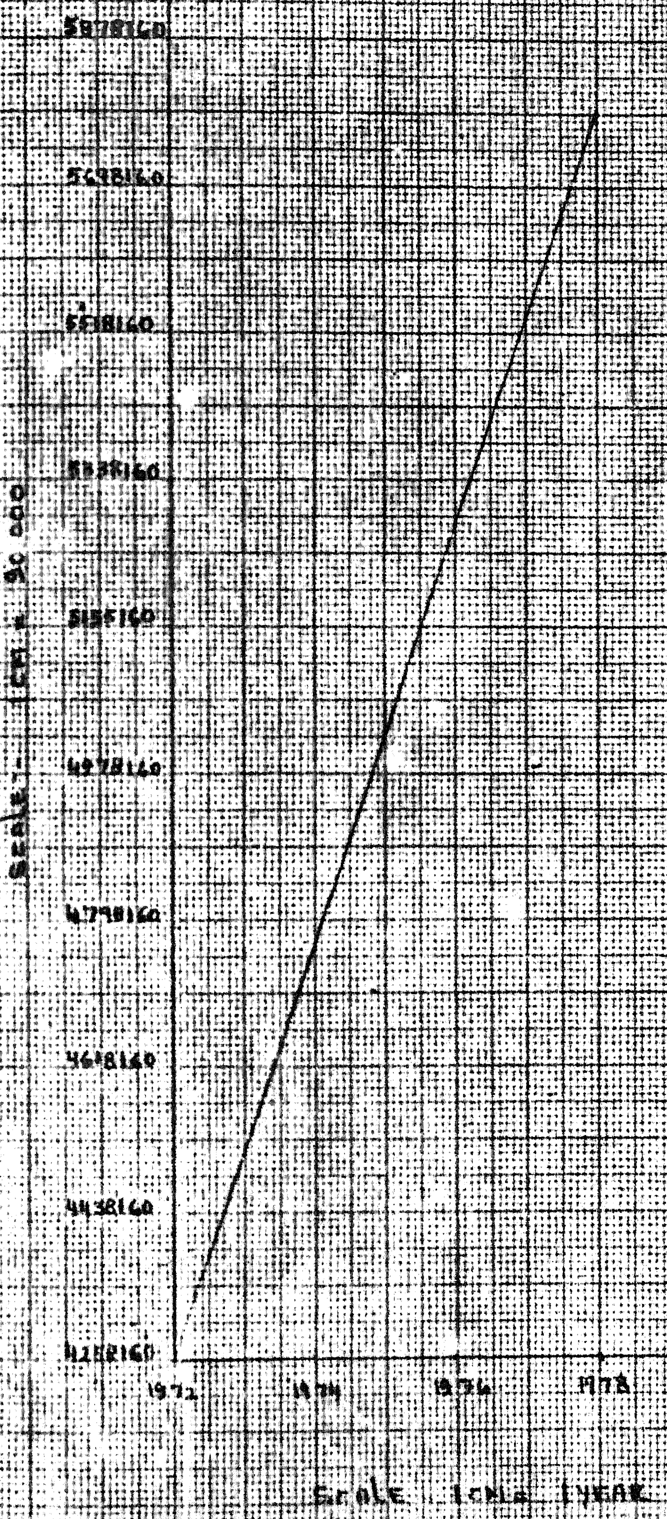
available and also without extra efforts. It is a common diet in all the countries of the world because the other diets are too costly and every farmer cannot afford their cost. In Bundelkhand region, the production of berseem is higher than in any other part. So the demand of berseem is higher than the demand of other fodders. At many places the fodder is cultivated automatically under natural practices.

In 1974 it is observed at Indian Grassland and Fodder Research Institute, Jhansi that 503.71 quintals green fodder and 86.76 quintals dry fodder were consumed by five dairy animals. 140.43 quintals green fodder and 23.46 quintals of dry fodder were consumed by a cross breed cow in one year, with one calf which yielded 1290 litres of milk.

A cow who gives 2.5 kgs. milk requires 8 kgs. green fodder, 6 kgs. bhusa and 1/2 kg. concentrate per day.

Population of cows and demand of fodder in Jhansi district is given below :-

DEMAND OF GREEN FODDER
IN
HAMIRPUR



Population			Demand of fodder					
			Green fodder			Dry fodder		
1966	1972	1979-80	1966	1972	1980	1966	1972	1980
69570	93162	157447	547560	745296	1259576	417420	558972	944682

The above table shows that the population of cows in 1979 was higher than that of the last census. So, the demand of fodder was higher than last census.

A buffalo who gives 8 kgs. milk requires 10 kgs.green fodder, 8 kgs. bhusa and 1.1/2 kgs. concentrates.

The population of buffaloes and demand of fodder is given below :-

Population			Demand of fodder					
			Green fodder			Dry fodder		
1966	1972	1979-80	1966	1972	79-80	1966	1972	79-80
35809	46021	81630	358090	460210	816300	286472	368168	653040

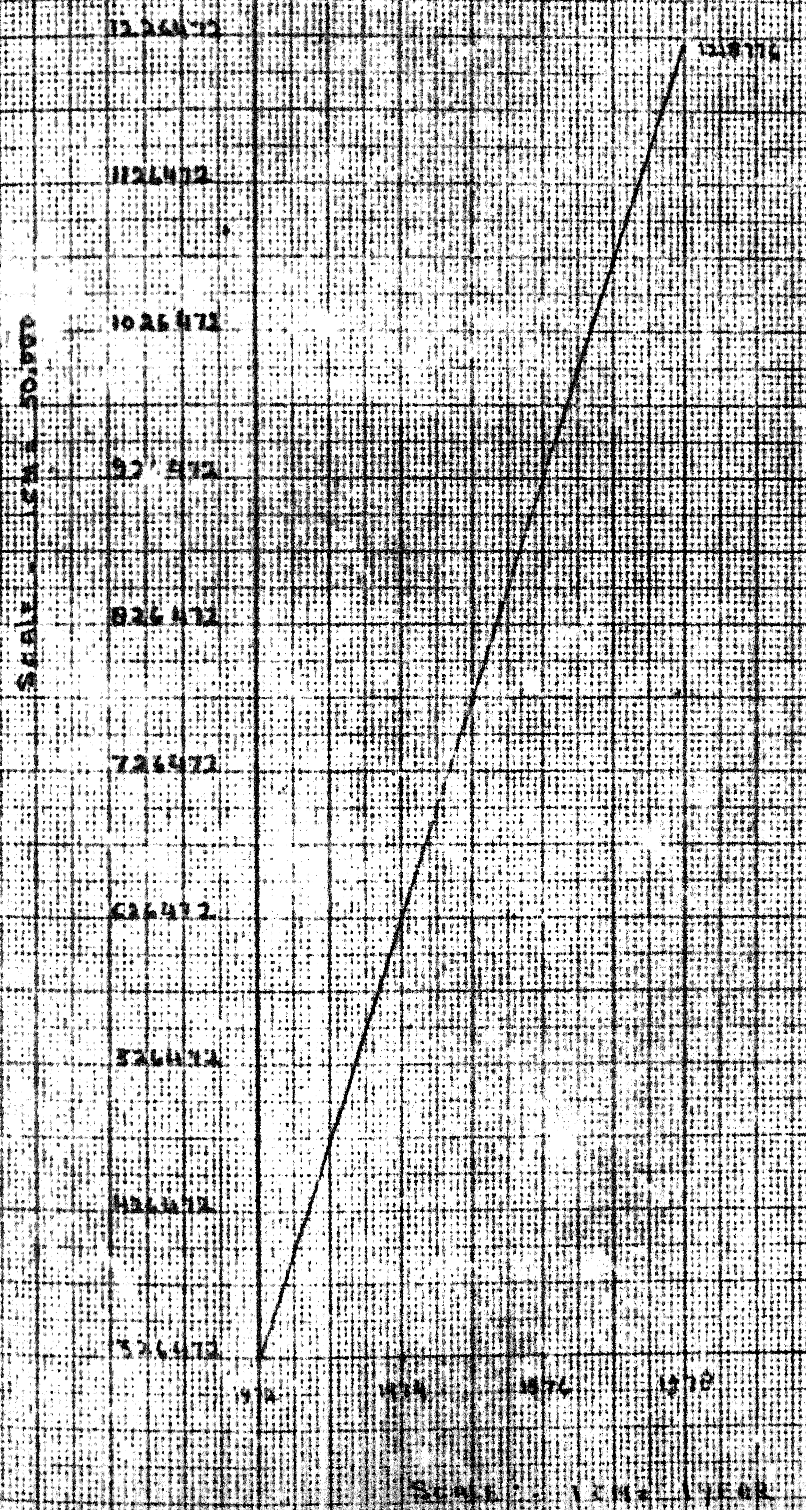
In 1979 population of buffaloes was increasing. So, the demand of the fodder in 1979 was higher in relation to the demand in 1960 and 1972.

Population of cows and the demand of fodder in other districts of Bundelkhand is given below :-

DEMAND OF GREEN FODDER

IN

LALITPUR



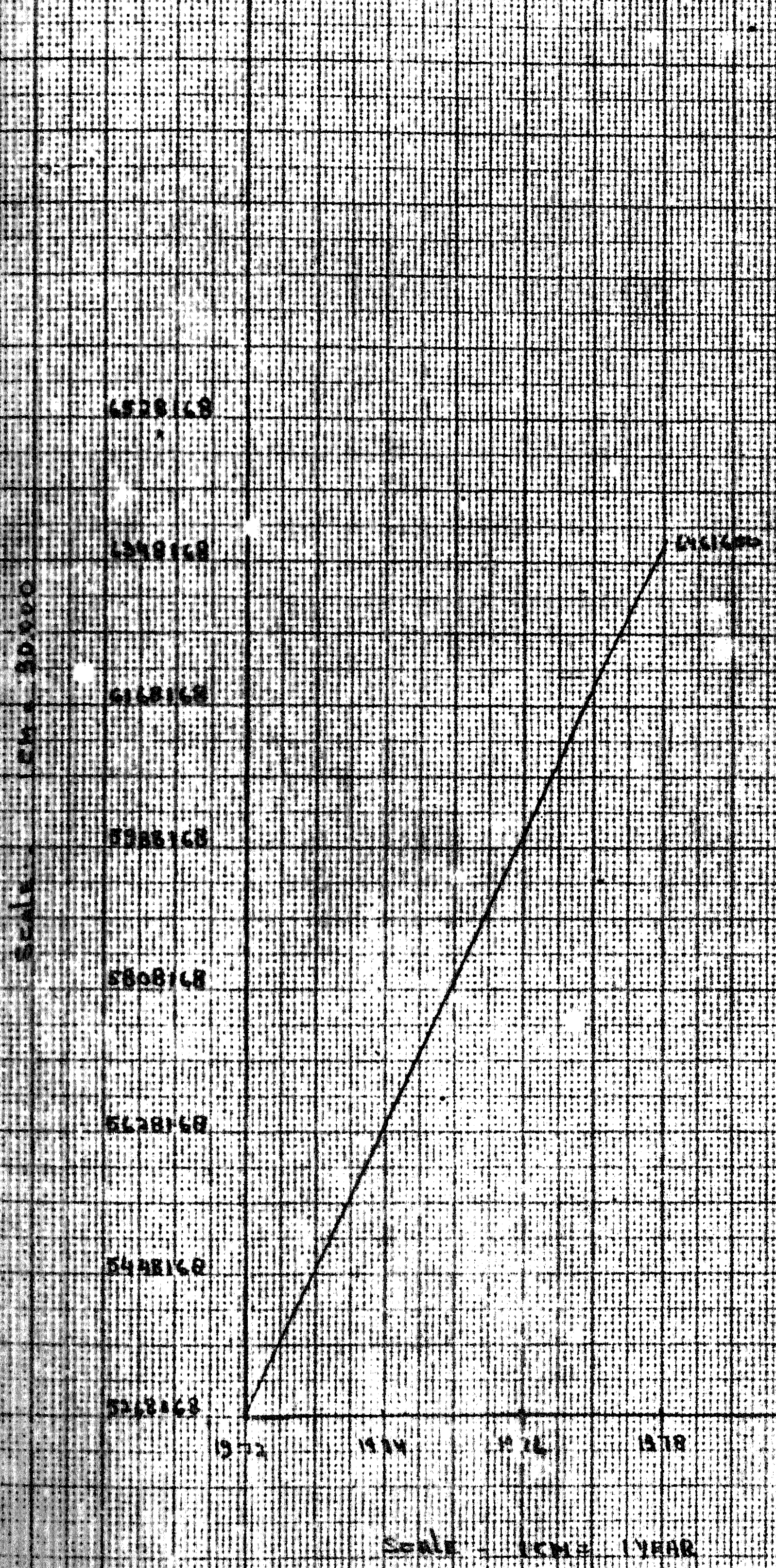
District	Population		Demand of fodder			
			Green fodder		Dry fodder	
	1972	1978-79	1972	1978-79	1972	1978-79
Jalaun	404500	459069	3236000	3672552	2427000	2734414
Lalitpur	40809	152347	3264472	1218776	244854	914082
Hamirpur	532270	723545	4258160	5787360	3193620	4341270
Banda	658521	807700	5268168	6461600	3051126	4846200

The strength of cattle of Bharai farm Jhansi in 1979-80 was as given below :-

Cows	..	89
Buffaloes	..	54
Heifer below 1 year	..	21
Young bulls	..	98
Bullocks	..	17
Heifer above 1 year	..	17
Horses	..	1

One cow takes 8 - 10 kgs. dry fodder and 40 kgs. green fodder in a day while a buffaloe takes 50 kgs. green fodder and 10 - 12 kgs. dry fodder. Heifer takes 3 - 4 kgs. green fodder and thus total demand of fodder at Bharai farm is 10018 kgs. per day.[1]

DEMAND OF GREEN FODDER
IN
BANDA



Now the number of cattle has increased. Thus the commercialisation of cattle feed is essential. So, new technology should be used. We should not be contended with traditional fodder production and its consumption as cattle feed but certain new methods can be adopted in order to commercialise the fodder products as subsistence feed for cattle. The fodder supply and its productivity has to be increased substantially in order to arrange fodder supply to cattle on commercial basis. The developed technology of maintenance and preservation of fodder products should be worked out so as to provide fodder to the cattle throughout the year. The fodder products have to be preserved and managed for cattle feed just as grain and other food supply are preserved and managed for human consumption. Fodder is a raw material and has assumed a wide dimension recently. What is needed is to nationalise the fodder production and consumption.

2. SUPPLY OF FODDER CROPS IN RELATION TO ITS AVAILABILITY:

With an increasing cattle population, the supply of fodder for domestic animals, is also getting more and more difficult every year. The area under fodder has

increased only by less than one per cent within the past 25 years but the pressure of bovine population has increased during the same period from 74 to 98 animals per 40 hectares of arable land. This is landing into a situation when the animals would not get even one-third of what they need for a maintenance ration of 4.53 kgs. of rougha-ge per day and 2.72 kgs. of green grass for a body weight of 227 kgs.

Thus there is an urgent need to increase our fodder resources three fold. This increase should also be in crops other than that of paddy because paddy which now forms the bulk of cattle roughage is a very poor feed and needs be supplmented with more nutritious foodstuffs.

Grazing if poor during most of the months of the year except for a short period during and after the monsoons and the available foodstuffs are not sufficient to support the existing cattle population. For this the system of the mixed farming is used instead of arable farming. In the mixed farming the land is utilised not only for raising food and cash crops but also to produce enough fodder for working and dairying animals as well as for the poultry

reared on the farms. The fodder resources can be improved by the adoption of better techniques of production, introduction of exotic type nutritious fodder. Development of grassland farming is improving the grazing grounds near forest and villages and by a careful preservation of surplus fodder.

Bundelkhand has a large population of live-stock but their productivity is very low with the result of that the gap between the availability of live-stock products and their requirements ever continue. A survey of the present position in Bundelkhand and demand of animal proteins in Bundelkhand reveals that against the nutritional standard of 2.84 grams of milk per adult per day, only about 140 grams of milk are available. Similarly against the total annual requirement of about 7 million tonnes is available. Likewise the present supply of eggs works out at about 12 per adult for the whole year whereas the need is a maximum of one egg per day.

This gap between the supply and the demand of products is due to the less supply of fodder according to its demand. One major reason for the poor performance is

malnutrition since we are disproportionately short in requirements. It has been estimated that the supply of green fodder is less than one-third of our requirements. This is not surprising as the area cropped under fodders is only four per cent. Further there is little forage conservation to provide nutritious fodder in the off-season. The concentrates besides being expensive are also in short supply by over 60 per cent.

Intensive milk production programme depends essentially on the supply of the high tonnage and the high quality of green fodder throughout the year.

Farm section of I.G.F.R.I. also undertakes general cultivation for supply of fodder for drought and dairy animals maintained at the farms. Seed production of important fodder crops is also undertaken each year. 40 - 60 quintals of seed of various fodder crops is supplied to different State agencies and Research Institutes. Seeds of improved cultivators coming out of research programme will be continued to sbe multiplied and supplied for the extension work on cultivator fields.

In Jhansi the supply of fodder is less than in Jalaun. In Jalaun fodder production is higher in comparison with other districts of Bundelkhand. Banda is drought hit area and the supply of the fodder is very poor.

In Bundelkhand region the fodder is produced by individual, State and cooperative Societies. In Jhansi fodder is mostly supplied by individual farmers and also by Bharari farm and military farm.

I.G.F.R.I. has 125 hectares land under fodder cultivation.

Production of fodder in 1979-80 is given below :-

	Fodder	Supply in Quintals
1.	Guar	22,000
2.	Cowpea	28,125
3.	Soyabean	18,750
4.	Bajra	37,500
5.	Jowar	43,750
6.	Makchari	41,325
7.	Oat	34,375
8.	Jai	37,500
9.	Barley	31,625
10.	Berseem	75,000
11.	Lucerne	62,500
12.	Sengi	36,875

The average production of the fodder in Bundelkhand is 250 q/ha. The area underfodder cultivation in Jhansi, Jalaun, Banda, Hamirpur and Lalitpur is as given below :-

District	Area(hectare)	Total supply
Lalitpur	5,06,272	4,42,40,200
Jhansi	5,05,547	3,53,88,290
Jalaun	4,59,069	4,81,92,145
Hamirpur	7,23,545	7,09,62,810
Banda	8,07,700	6,21,92,900

Thus the supply of fodder in Lalitpur, Jhansi, Jalaun, Hamirpur and Banda is 87.5 q/ha, 70 q/ha, 105 a/ha, 98 q/ha and 77 q/ha, respectively.

3. ELEMENT OF COST AND PRICE STRUCTURE IN FODDER PRODUCTION AND CONSTRUCTION:

India is an agricultural country. Its land is fertile for crops such as wheat, rice, maize and barley. The cultivation is done by the farmers and the fruit of cultivation is enjoyed by all of us. The whole of farming depends on this cost structure and subsequent price level. The main elements in cost structure are bullocks, human labour, tractors, seed drillers, plough, harrower, cultivator

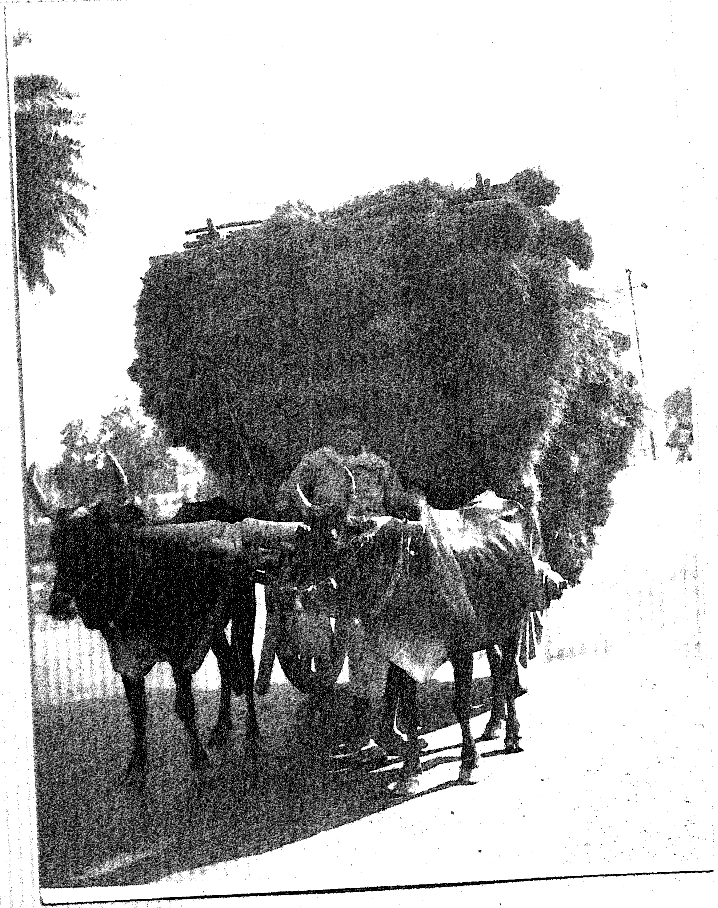
tubewell, pumping sets and fertilisers.

BULLOCK: Cattle play an important role in human life. Bullocks are important or necessary for a farmer. Not only it helps in agriculture but even it helps in transport. The roads are not well constructed in villages, so transport of trucks, buses are not possible. This work is done by bullock carts. Besides this the maintenance of bullock cart could be done easily. It is not very costly. Its construction is cheapest and local. On the contrary the maintenance of trucks is not so easy and are expensive too. If the transport is not cheap then it will effect the price of fodder because a farmer has to take out his average expenditure and has to see to the profit also. Hence, bullock cart is useful and comfortable transport of rural economy.

Hindu religion protects cattle as it is related to the life of man. The bullocks help in agriculture as well as for transport.

The farming operation is generally carried on by the use of a pair of bullocks but two or three pairs could also be used. These additional bullocks are usually hired during the peak season.

BULLOCK CART WITH DRY FODDER



The cost of the management and maintenance per pair per day and per hour as well as its allocation in the different constituent had been worked out from the half-yearly data of 1980. The total cost per day rates from Rs.8/- to Rs.10/-.

SOIL: The first and the foremost element of fodder production yield depends upon the quality of soil, whatever it is fertile or not. Fertile soil and land gives good production.

Only the fertile soil is not enough for good production The fertility should be maintained. The soil must be sent for its examination. It should be tested from time to time. There will be some expenditure which will include in cost.

PROCESS OF CULTIVATION: Each and every farmer must have enough knowledge about the technology of forage farming for the process of cultivation. Interculture and weeding is necessary in the initial stages for good land and cultivated grass. When the rainfall is not enough, hoeing is necessary as fodder takes time to establish in weed infested field. In Bundelkhand region hand weeding is quite popular. Separate cultivation of fodder is not done in Bundelkhand region.

Many resources for cultivation are developed but the farmers are ignorant of the utilisation of such implements. Utilisation of such is possible when one is alert about the production. The should be co-ordination between the various agencies and the units. without which one could not expect good results. The tilling and weeding is done. The land is cultivated by cultivators or bullocks. In ancient time oxen were used. Two or six oxen were used at a time with the plough. But, in modern age appliances like tractors a re used as cultivators.

The rate of cultivation is Rs.1,200 to Rs.2,600 and the rate of cultivation per hour is Rs.45.80. Plough is used in three or four years during the process of cultivation. Seeds are then drilled. This drilling would be carried on either by the farmer or by the seed driller. The rate of the drilling of the seeds per hour is Rs.35 - 40 and the rate of a driller is Rs.4,500/-.

After this harrowing is done. This could be done by bakhar or harrower. The rate of a harrower is Rs.5,000/- to Rs.6,000/-.

HUMAN LABOUR: A farmer is an important person in our

society. He is the life and soul of villages. The production of crops depend upon the strength and capability of the farmer.

Farmers work hard in the field. Not only the farmers but their animals too work hard with the master in the farms. The cost of human labour is unestimable. The cost of product depends upon the amount of human labour. When the crops are ready harvesting and reaping is done. This is done by the farmer himself or he employs men and women for reaping.

Farmers may be of two types, rich and poor. Rich farmer could employ labours to work in his field while the poor work themselves.

Maximization of human inputs done by various working agencies that are meant for fodder production. We should determine the amount of fodder production. After determining this factor we should develope infrastructure to maximise the fodder production so as to have optimum utilisation of human resources of the region. In this way there is no clash of human inputs in relation to food production.

Some rich farmers give their land to those farmers who are poor and have no land and are starving. They give the land on fixed amount of share. Indian farmer is generally too poor to pay the wages in cash or in the form of money. That is why the wages given to the labourers is in the form of grain. Thus, the human labour cost is unmeasurable.

FERTILISER: In the modern technology fertiliser become a MUST but it is unfortunate that our resources are rather meagre. The application of fertiliser has recently shown an upward trend and it has become quite popular among the cultivators.

Farmers have been using fertilisers for a long period but they consisted of the grain crops. The farmers were ignorant of the requirement of the fertilizers for the fodder crops. Though the farmers buy fertilizers from various agencies yet they are not guided how to utilise the fertilizers for the purposes of fodder production.

There should be co-ordination between fertilizer agencies and the farmers. The fertilizers are useless

if there is no verification from time to time.

The cost of the fodder is related with the cost of fertilizer. Mostly nitrogen is supplied in the form of urea. In 1977-78 the rate of urea was 192 per quintal and the rate of mixture nitrogen, phosphorous and pottasium permangnate was Rs.230/- per quintal but the price was increased upto Rs.280/- per quintal and Rs.325/- per quintal in the year 1979-80.

<u>IRRIGATION</u>: Irrigation plays an important role in the different parts of the region depending upon the nature of the soil.

In ancient times the farmer used to irrigate the crops by the natural resources such as rivers, canals and rainfall. But now with new scientific means rain water is collected in a place called as dam.

The fodder crops are irrigated with the grain crops as they grow together.

A common method of irrigation in Bundelkhand is by the conservation of contour bundhies. They are small bunds, raised a few feet about the ground to collect rain water which keeps the soil wet until the Rabi sowing.

Water is then let out and crops are sown. The cost is Rs.80 to Rs.500 per acre.

The average cost of providing irrigation by means of contour bundhies varies according to gradients of the country from Rs.250 to Rs.500 per acre. These benefits are comparable to the costs of some other irrigation works.

The cost of an ordinary masonary well in other parts of Uttar Pradesh is about Rs.2,000 and area irrigated by these is 5 acres. Cost benefitted per acre is Rs. 350 - Rs.700. In Bundelkhand region a similar well cost is about Rs.6,000 and the cost per acre benefitted is Rs.1,200 which is too high and uneconomical.

Apart from the capital cost for constructing the well which is about Rs.50 every ordinary crop the equivalent cost from Government canals is Rs.15 to Rs.20 per acre.

It is thus apparent that masonary well is highly uneconomical not only for irrigation in Bundelkhand but also in the matter of capital and expenditure.

<u>ELEMENT OF PRICE</u>: The final market price certified for fodder in a free market is the result of many interacting factors such as demand created for the fodder, price of

other inputs and knowledge and availability of average farmers to buy enough fodder to fix the sale price.

Other factors that directly effect the price are the following :-

1. Average cost of production of fodder or contract price paid to the grower.
2. Processing and packing charges.
3. Storage.
4. Trassportation.
5. Interest on the capital.
6. Dealer commission on sales expenditure.
7. Storage losses.
8. Publicity.
9. Return to capital.[2]

If the basic cost in the production is high then the price will be high and if the cost in production is less then the price will also go down. Market price is also related directly with the price of the godowns. This is because while fixing the price the farmer has to take out the average cost he spent for cultivation and he has

to take profit also for his own expenditure and cultivation for the following years.

After harvesting the fodder is bounded in bundles, packed or in other forms. The cost of packing is also included with price.

Surplus fodder is preserved in the form of hay or silage. Thus, the storage cost is related with the rent of godown or field on which fodder is stocked.

Poor farmers take loan or they borrow money either from the rick farmers or from banks on interest. In ancient times, farmers were taking loan from the Zamidars. These zamidars used to cheat them as they were innocent. But now the Government has opened banks for such purpose. Banks give loan to these farmers. This loan will be added with the price of the fodder.

There are some dealers for selling the fodder to the retail sellers. These dealers take their commission which affects the price of the fodder.

For the publicity of fodder, fodder exhibitions are held. So, there will be some expenditure on the

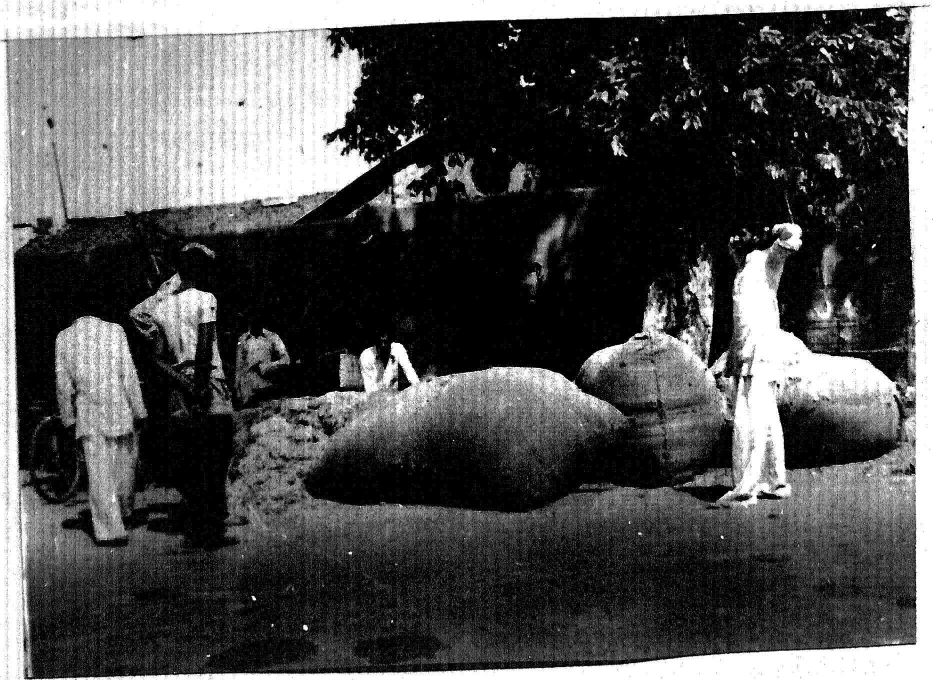
publicity. This expenditure will affect the price of the fodder.

Prices should be within the reach of common man so thatthe production of one crop may not be replaced by another crop. The price structure should be maintained in such a way which avoids the choice of agricultural production. Normally the production of different crops should be in accordance with the local demand and supply of production.

4. MARKETING AND DISTRIBUTION:

The grain is harvested and cleaned. After this it is sent to the consumers. There are many means and resources to send this grain to the consumers. Some of them are sent by truck and bullock carts. State buys the wheat from the farmers directly and sends to the various Societies. Accordingly through which the grain is brought in the market. State also has "food godowns" to supply the grain. The grain is supplied in open market or it is directly supplied to the seller or vendors who sell it in a large quantity. From there it is brought into the market. But the fodder production is not developed in

FODDER MARKETING



Bundelkhand region. The farmer is satisfied with the amount of fodder he obtains. He does not grow fodder according to the demand. The quantity of fodder generally produced is sufficient mostly for his own cattle.

The vendors of fodder sit by the side of road with their bundles. In Jhansi fodder is sold in the vegetable market only and there is no organised agency facilities.

The number of animals is increasing day by day but no a ttention is paid towards the production of the fodder.

We all know that food grains are very necessary for man. Man cannot live without it. In the same way fodder is essential and necessary for animals. The life of man is directly or indirectly related to animals and the life of animals is related to fodder.

Animals feed on fodder, if they are under nourished, they do not remain healthy as they should have been. Those animals which are fed on fodder remain healthy. Suppose if cow is fed with food fodder then it will give good milk and in large amount. But if it is not nourished well it remains weak.

Thus we see that men and animals both are related to each other. Hence, special attention should be paid towards the production of fodder. There should be developed fodder godowns like food godowns in Bundelkhand.

In early times the fodder production and consumption was mostly localised. Even the marketing and distribution was done according to local conditions and the process of its production and consumption was managed locally. There was hardly any organised agency for fodder supply. Feeding cattle were considered the concern of the cultivators. They managed the whole show according to their limited resources. There had been instances when the cultivator gave priority to feed. Cattle has sacrifised his own food. With limited income the cultivators and the villagers at times either neglected cattle or neglected themselves and their family. Even then the localised cattle management in the village life had the tradition. Cattle had always been a source of strain in the life of villagers. Cattle was given a prominent place in the rural life and this has also influenced the urban life. The old methods and system of cattle maintenance are no longer appreciable now.

With the increase of cattle population and with the steep rise in the prices it has become too difficult to maintain cattle and provide them food. Nothing to say cattle even the village population is victim of the price hike. Now the time has come when the fodder production should be developed in Bundelkhand in accordance with the increased number of cattle.

The fodder marketing has to be developed almost on the pattern of food grain marketing in the region. It has to be a policy decision cattle cannot be neglected any longer. If the society expect something from the cattle then cattle should be well looked after. The cattle have to play an important role and they have to be given a prominent place by the State in its economic planning so as to have maximum utilisation of cattle resources. Indian agriculture economy is fundamentally based on cattle wealth As such fodder making has to be developed on rationalised lines all over the region. Bundelkhand is gifted with lot of fodder potential and so its marketing has to be arranged in such a way so that it can be readily available for consumption.

The distribution agency of fodder production should be so organised on decentralised basis so that it can be convenient for the cattle owners to obtain cattle feed without difficulty. The patter of distribution should be in relation to procurement through State organised agencies. Procurement should be through co-operative or other agencies. Proper stocking is essential and distribution should be as simple as possible. The traditional retail and wholesale system has to be reorganised in order to eliminate middle men profit and also to establish and minimize fodder prices. There should be a nett work of marketing and distribution in the area. Fair price shops for fodder distribution should be developed by State. Proper arrangement of godowns for proper stocking of fodder should be managed. Transport facilities should be readily available for procurement of fodder supply.

5. ECONOMY OF FODDER PRODUCTION IN BUNDELKHAND:

The input and output details of individual crops were prepared separately for small and large size holdings as well as for irrigated and unirrigated farms. Inputs were grouped into many categories namely human labour,

bullock labour and fertilizer, irrigation facilities, land revenue, insecticides and pesticides, changes for depreciation and repairs and interest on working and fixed capital.

The study is carried out in Bundelkhand region. The data used in the study are based on a survey of thirty farmers classified under four size groups of holdings viz., 0.2 hectare, 2.4 hectares, 4.6 hectares and 6 hectares and above. The data pertains to two villages of the region. All the farmers in the selected villages were enumerated and 30 farmers comprising 6, 9, 9 and 6 on the above mentioned size group of holdings.

It is seen that all the four resources included in the equation are found to have significant and positive impact on crop return per hectare. Expenditure on bullock labour and expenditure on items other than manures are items showing a higher magnitude.

The bullock labour productivity is nearly equal to its factor cost but the ratio of human labour productivity to its factor cost is less than one. This indicates that the farmers in the region are rational in the use of only bullock labour. They are not exploiting fully the economic

opportunity of manure and other items of farm expenditure including irrigation as the level of the use of these two resources is relatively low. On the other hand they are making excess use of human labour resulting in its marginal productivity being lower than its acquisition cost. The productivity of labour could be increased either through cuts in its land of use or through on increase in the level of other resources or through both.

It was found that of the total labour hours used per hectare on the farm, 75 per cent of the requirement is met in the form of hired labour. Therefore, a cut in the labour resources, one-fourth of in the form of hired labour which is used in pre-harvesting operations such as ploughing, weeding etc., and the diverting of funds to the other forms of expenditure have resulted in increasing the productivity of human and bullock labour. The rationality of allocation of funds is such that the marginal value produce per rupee expenditure in manure and other expenditure is equalised. The level of bullock labour used is not distributed because it already pays for itself. However, in case of this adjustment these would emerge the scope for farm unemployment

which could be tackled only through opening new revenues. The re-allocation of the funds increases the productivity of the human and bullock labour.

To know the economics of the cost of production, many experiments have been conducted at I.G.F.R.I., Jhansi.

M.P.Chari was sown in 2.0 hecatare in kharif season which yielded 550 quintals (275 q/ha) green fodder while in Rabi season berseem was sown in 1.5 hectares area which gave 765 quintals/ha. fodder along with 0.56 quintal berseem seed. Oat (0.5 ha.) gave an yield of 142.5 (285 quintals/ha.) green fodder during rabi season. In the year 1978-79 MP Chari and guar yielded 281 quintals and 233 quintals green fodder per hectare, respectively, and in 1979-80, 566 quintals green fodder from berseem, 1.25 quintals berseem seed per hectare were harvested. From the above observation it may be said that rabi crop had superiority over kharif crop in yield as well as cost of cultivation. The fall of in the unit cost of output of MP Chari was caused by the large economic in use of manure, labour and fertilizer which offset the loss by poor harvest on account of heavy and abnormal rains.[3]

The crop rotation followed by this unit was as under :-

Crop rotation	Yield	Expenditure Rs./ha.	Income	Profit
MP Chari + Berseem	785.0	1,302.00	5,455.00	4,153.00
MP Chari - Oat	560.0	1,276.00	2,800.00	1,524.00

This shows that crop rotation involving berseem and MP Chari was more economical than when Oat, MP Chari rotation was followed.

The cost of production of individual crop was also calculated and presented below :-

Crops	1972-73	1973-74		1974-75		1979-80	
		Cost	Yield	Cost	Yield	Cost	Yield
1. MP Chari	3.20	6.43	101.71	2.37	7.75	..	..
2. Guar	4.22	..	..	..	..	..	..
3. MP Chari + Cowpea	2.74	..	..	..	..	..	..
4. Cowpea	..	12.24	85.44	..	..	9.00	185
5. Berseem	3.24	3.24	403.67	2.90	510.00	1.50	985
6. Oat	5.89	4.28	272.00	2.19	285.00	2.75	300

The total expenditure incurred on dairy operation (variable + fixed) was Rs.9,327.46 and the total income from the sale of milk worked out to be Rs.14,258.00 giving a profit

of Rs.4,930.54 only from the dairy. The cost of production of milk in Bundelkhand was worked out to be Rs.1.30 per litre while in 1979-80 and 1980-81 it was Rs.2.50 - Rs.3.00 and Rs.3.75, respectively. Out of the total expenditure incurred in the dairy operation (variable + fixed) was Rs.27,90,56,875 and the total income from the sale of milk worked out to be Rs.59,12,08,500 giving a profit of Rs.31,21,51,625 only from the dairy.

Animals are an important organ of our economic arrangement. There are many uses of cattle through which man carries his business and earns money.

Cattle grazing had been common in Bundelkhand and cattle had been roaming about in different parts in search of grass in leaves. The dry climate of the region also adds to the problem of food for the cattle . It was not economical to produce fodder for the cattle at the cost of cash crops in Bundelkhand region.

With the economic development around Jhansi it has now become essential to manage fodder production and to work out its economy so as to feed the ever increasing number of cattle around Jhansi. The live-stock of the region ha to be fed properly and certain areas are supposed to produce

fodder for the live-stock. The Indian Grassland and Fodder Research Institute, Jhansi has been a great help in working out fodder production and fodder management in the region. The State government is supposed to undertake various schemes of fodder production and to arrange its supply regularly in the open market as well to individual consumers. Fodder production in the area can no longer be neglected but it has to be developed in relation to the availability of land and resources. Around Jhansi, land can be well utilised for producing fodder.

It would be economical to produce fodder in areas where cash crops are not cultivated. The rotation of crops should be so managed that in between the various crop seasons fodder production can be arranged economically. Fodder can also be obtained out of cash crops and so the deficiency of the fodder production in the area can be easily and economically made up. The rural live-stock can be assured of fodder supply. It will be still economical to manage fodder production in the region instead of depending on neighbouring areas. As soon as fodder production is rationalised its economy can be safe-guarded. Proper sowing

of various varieties of grass should be taken up which can be a fed for the cattle. Areas thus covered with grass used as feed and also areas under exclusive fodder production should be separated and proper fencing should be done for its protection and preservation. There should be a separate organisation to look out for fodder production, marketing and distribution as well as storage.

CHAPTER VII

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CHAPTER VIII.

FUTURE SUGGESTIONS OF FODDER CROPS IN BUNDELKHAND.

1. PRICE BEHAVIOUR OF FODDER CROPS IN RELATION TO DEMAND AND SUPPLY:

Price factor of fodder crops is an important element in relation to its demand and supply. Fodder happens to be one of the cheapest and easily available food for animal feed and it is procured from rural areas. Our fodder production was not streamlined in the past but its supply was well regulated in the conventional village economy. There was no difficulty in obtaining fodder for cattle feed because it was readily available in villages. The consumption of fodder in urban areas are mostly supplied from villages. Fodder happens to be surplus in rural areas and so it is comparatively cheaper for consumption. The astray cattle search their

own food while private owned cattle get fodder food through their owners. Similarly in urban sectors fodder food is supplied to cattle through their owners at the same time astray cattle manage their own food. Under these circumstances the movement of fodder supplies from rural to urban areas are mostly dependent on demand supply factor. The price behaviour is an important factor which has to be kept at reasonable limit in relation to its demand and supply, considering the consumption limits in accordance with readily available fodder market. Apparently there have been no difficulties in maintaining fodder stock both in rural and urban areas. With the increase of cattle care it has become necessary that ready fresh stocks of fodder should be available at reasonable rates both in rural and urban areas. Buffer stocks piling and regular and constant fodder from place to place has become essential for the cattle wealth almost on the same lines as in the case of food stocks for human consumption. Fodder prices are bound to fluctuate from time to time. It is generally noticed that even substandard fodder is consumed which is unfair for the cattle health during the

period of shortages. It is necessary that price structure of fodder is maintained at a level so that price fluctuations do not harm the cattle health. The cattle owners are now very careful in providing standard fodder food to their cattle in order to maintain health of their animals. There may be certain periods in year when fodder prices go up on account of short supplies and create temporary shortages both in urban and rural areas. The fodder stocks should be maintained in such a way so that fodder is available at reasonable rates with slight fluctuations in prices, specially during certain part of the year. There should be pooled fodder stocks so that factor of price fluctuations is minimised. Sub-standard fodder should not be provided for cattle consumption and should better be used as a fertilizer. Price fluctuations are usually man made and it is necessary that some sort of legislative measures are implemented in order to sustain the impact of price behaviour. Fodder management should better be on a nationalised basis and should not be left to individual suppliers, producers and hoarders.

Even if fodder is distributed from fair price shops

it will surely help to cover the threat of price fluctuations. Minimum health care for every cattle is necessary for its survival. The cattle population has to be checked and controlled so that their health is maintained properly. Cattle wealth is both under personal ownership or in the form of astray cattle. Even slaughtering of cattle should be legally confined and controlled so that the population of astray animals can be well controlled. It is generally noticed that both in rural and urban areas only those cattle are cared for which are useful and beneficial to their owners and they generally allow those cattle to move freely which are of little use to them. The increasing cattle population is becoming a menace to society and it is difficult to share the burden of feeding them properly. The cattle cannot be allowed to move freely from field to field in search of food, but such cattle should be concentrated at different places so that they may be assured of their food and better control. There is no doubt that the stability in fodder prices can obly be obtained by controlled cattle population and at the same time increase fodder production and provide fodder feed at reasonable prices

both in urban and rural areas. It is necessary that the profitability of fodder production should be worked out. There can be exclusive fodder production as well as procurement. At the same time fodder can be a subsidiary agricultural crop depending upon the marketability and cost input - output ratio. The purpose to maintain high order of fodder qualities and do not use fodder as if being a discarded item of agriculture.

2. PRICE GRADATION FOR QUALITY PRODUCE STANDARDIZATION OF FODDER PRODUCTS:

It is essential that fodder in Bundelkhand should be properly graded and their price structure should be according to its varieties. This will help in providing proper fodder for the nourishment of the cattle as needed. The requirement varies from animal to animal. Standardization of fodder is essential for the provision of better food for cattle. This will determine the ratio of consumption of fodder per cattle and the fodder stocks will also be maintained by which price variation of fodder will take place. During the year when price falls, it is the ideal

time when one can make reserved stocks of fodder for the year. Similarly when the supply is curtailed there should be sufficient stocks available for the consumption of the cattle. Standard fodder supply should be available for the cattle according to gradation throughout the year.

In this way, price variation will be limited and the consumers can hold stocks on account of availability. The local consumers of fodder are quite ignorant of the demand and supply fluctuation in relation to the price and it can be possible that their ignorance may effect the food provision for the cattle. It would be better if the fodder products are collected by some organized agencies. Fodder is to be distributed regularly among the consumers at reasonable rates. The pattern of storage and distribution of fodder should be on the line of food grains, managed by the Food Corporation of India. This arrangement may be well organized for proper maintenance and full utilization of fodder stocks and their distribution for regional consumption. If such stocks are maintained properly then different types of fodder products and by-products can be

managed. Food for the cattle should be assured and readily available throughout the year at many places so that procurement by the consumers is made at a short notice. The place for its distribution, stocking gradiation and price structure are to be rationalised. Fodder preservation maintenance and weighing system should all be well managed. Cattle wealth is in no way inferior to local population. The efforts for cattle food are to be made on the same lines as it is done in case for human consumption. Cattle wealth has an important place in our economy and we are supposed to provide all necessities for the survival of cattle. Fodder is the only food for the cattle and it should not be difficult to maintain regular and standard supply for the survival of the cattle wealth of this undeweloped Bundelkhand region. The management of cattle should be on the same footing as we do in the case of food supply for human consumption. Fodder production should be more or less like an industry and its infrastructure is to be developed accordingly. If the cattle wealth is on the priority list of our planning programme, similarly fodder development should also be on the priority programme of

the government and the people.

Fodder production and its economy are closely linked with the cattle welfare schemes and it is a part of cattle management programme of the State and the Centre. It becomes a responsibility not only of the cattle owners but also of the Government and semi-government agencies to organize and maintain fodder production.

There have been marked price variation of fodder during the last several years as the demand is gradually increasing without substantial increase in fodder supply. There have been no specific step by local population of the region and also by the system to develop fodder production, in order to meet the increasing demand. Fodder production had not attracted the local population and its supply remain irregular throughout the year. Fodder management has now become essential not only in Bundelkhand but far and wide in order to provide proper nutritive food to the cattle population.

The cattle of this region is greatly hard hit and traditional methods of fodder and its management has now

become obsolete. The factor of demand and supply is unknown to local people and the State in relation to the cattle population. In addition the maintenance of cattle has long been ignored and had not been included in the priority list of regional planning. It is high time now that proper utilization of proper resources should be fully exploited in the region. The process can be maintained if State management is fully utilized in relation to fodder production, distribution and maintenance of proper stocks at reasonable price that of food stocks at reasonable price. Unfortunately the cattle wealth is not considered as important as human wealth. Cow or bullock may have special significance and utility for few individual group of people in a developed society but unless the importance of cattle as a whole is properly understood only then cattle will benefit the community at large. Cattle management is an important discipline in rural life of the country. The fodder is below the subsistence level and it is being substituted by sub-standard grasses also by other inferior and discarded food material for the use of cattle. This is because the present fodder

production has absolutely no relation with milch and non-milch cattle and as such large number of cattle population of Bundelkhand starves and there is no efficient organization which can under take the great responsibility for the nourishment of the cattle. The stage for standardization of fodder and its gradation will only arise when fodder production is well established and properly managed. How can we expect good milching and non-milching cattle without providing them fodder. The local cattle is greatly starved and we do not give them necessary food for their survival. Cattle give us milk and is used as power but we do not give them proper food for their service to humanity.

3. STATE TRADING IN FODDER AND DISTRIBUTION BY CO-OPERATIVE SOCIETIES:

Cattle grazing has been a common feature in Bundelkhand. Cattle are allowed to move freely on the field for grazing during the day. Grazing ground in Bundelkhand is along ~~by~~ river side on unused land and small hillocks and uneven landscap are abundant. There are hardly any

maintained fields for cattle grazing. Usually cattle search their own food and they return in the evening to their respective places. Grazing field in Bundelkhand can provide food to cattle only for 6 to 8 months in a year and the rest of the period from March to June is very dry and there is hardly any greenary which can provide food for the cattle. This dry period of Bundelkhand can not possibly be compensated in any form. Usually the cattle owners try to manage leaves of trees and shrubs and they take away leaves recklessly from green trees either by cutting or by stealing them from different places. This practice is extremely harmful for the cattle of the region and at the same time it destroys the blooming trees and the forest wealth of the region which cannot easily be replaced. This traditional practice has become very expensive to the wealth of the region. The solution lies in having organized methods of providing cattle food in the form of fodder produce. The people are reluctant to produce fodder for feeding their own cattle and they expect other agencies to work for them. Gradually the existing

grazing sources of Bundelkhand region are diminishing at a faster rate. It is a high time when proper production of fodder is worked out and developed with the assistance of State and local people. Bundelkhand region has sufficient land available and there are enough resources for cultivation of fodder. It is essential to develop fodder crop technology in the region to provide balanced food diet to starving cattle. The cattle wealth of the region cannot be allowed to go out in search of the food but the cattle wealth should be provided with balanced food diet, for their good health.

Trade in fodder had been very defective since past and it has become a monopoly of few who had been trading in accordance with their convenience without considering at all about the fate of the starving cattle. Persons managed the fodder supply in their own way either from their own fields or used to purchase fodder at unreasonable prices throughout the year. It was not possible for them to store fodder for yearly consumptions They managed fodder supply from their agricultural fields which was not q uite sufficient for yearly consumption.

It was not possible for them to maintain regular supply as they were dependent more on cash crops and allied cultivation for their economic survival. The importance of feeding cattle was secondary to them and they were accustomed to provide all sorts of food to the cattle including the left over food of human consumption and discarded unhygenic waste which had no value and this contaminated food had been harmful for the health of the catt le. This had been a common practice in rural areas of Bundelkhand and the cattle were allowed to roam about on the streets to procure and graze their own food. This had been a long practice which not only deteriorated the cattle health but was also a great nuisance and inconvenience to the urban and rural population. Such indiscriminate method of let lossing cattle to procure their food from streets, lanes and other residential colonies became not only an economic problem but also social insecurity. Even cattle is allowed to move about freely in cultivated areas and orchards, local gardens and by their indiscriminate movement they harm the growth of the vegetation to a very grate extent.

Fodder management and procurement of food is not the responsibility of cattle but it is the responsibility primarily of the cattle owners and also the State. Cattle management has to be taken up as a part of responsibility by the State and the time is ripe when trading in fodder should be taken over in undeveloped Bundelkhand. It is suggested that State trading in fodder should be introduced without delay and the details should be worked out in consultation with different classes of rural and urban cattle owners. Fodder management is a discipline in which cattle wealth is fully secured and feeding the cattle is a responsibility of the State like the human population. There should be proper organized cells for fodder trading fodder managed by the State. The State trading in fodder should be properly spread over in urban and rural areas where fodder stocks should be maintained for providing food for the cattle. Fodder trading should be on the principle of no-loss and no-profit basis. Cattle maintenance at its subsistence level is the very minimum which State can undertake and future health of cattle is surely dependent on future

plans of the State. If fodder trading is done by the State then the distribution of fodder should be given to co-operative sector in Bundelkhand. Co-operative distributive societies should be created for fodder distribution by cattle owners. Such co-operative societies will develop an infrastructure of fodder distribution amongst the cattle owners and they will serve as a great link within themselves and also with the State trading agencies.

In this way fodder trading and distribution will be properly harnessed with the help of close links between the State trading and co-operative fodder distributing societies. This type of management shall keep the interest alive of the State and cattle owners as they are supposed to share responsibility of feeding cattle collectively. The financial involvement as such should be properly cared by the State government and also by co-operative department. Central and Provincial co-operative banks are also to provide necessary credit facilities at early stages at reasonable terms. Necessary working s ubsidy can only be provided which can later be

executed on reasonable terms. In this way fodder feed is assured throughout the year. It is suggested that fodder department should be created and closely linked with Animal Husbandary of the region. Review of fodder stocks should be carried out thrice during a year so that regular fodder for cattle is assured. Planning Department of the Bundelkhand region and the State government should see that fodder trading and distribution is properly managed by an independent body. Such a body will help complete coordination at all level of government and non-government agencies. These fodder agencies should have their means of transport to provide quick supply at different rural and urban centres. Such transport agencies may better be under co-operative sector. In this way fodder enterprise will be developed in the region with the help of the State and co-operative sector.

4. FODDER COLD STORAGE GODOWNS AND RESEARCH:

Fodder feed is one of the perishable commodities. It is necessary to maintain fodder supply in relation to demand. The annual fodder supply has to be worked out so

that the food content in fodder does not perish away. Its supply and consumption has to be so regulated throughout the year in order to avoid short supply and also price fluctuations during stack season. Fodder for cattle has got to be equated on the same lines as food for human consumptions and their stocking and storage facilities have to be developed in Bundelkhand region. Cold storage fodder preservation should be established without delay. There should be proper and well established organization not only for food products but also for its regular supply in making sufficient stocks available. The price variation factor has to be considered so that proper stock maintained. The distributing agencies have to be worked out in complete co-operation with fodder godowns and cold storages so that cattle food is easily available, throughout the year. A chain of godowns and cold storages are to be established specially in Jhansi and other parts of Bundelkhand region and this net work will provide better facilities for the cattle wealth of the region. Research centres should be established in this region to help the State government and Central

Research Organization to find out the various water and protein contents in fodder and its preservation. Research centres will guide the local population about fodder preservation. Fodder food should be safe from bacterial infection throughout the year. Proper catalyst should be used for fodder preservation and its contamination should be avoided. Bacterial infection can cause poisoning of cattle food as such fodder should be tested in godowns and cold storages. Proper research guidance shall assure good quality of fodder in the godowns and cold storages.

Proper temperature should be maintained in fodder stocks so that fodder and its bacterial products are not disintegrated. There should be proper arrangement for necessary ventilation and sunshine so that necessary moisture is maintained in fodder. It is generally noticed that rotting and fermentation starts only in part of fodder due to moisture imbalances and it gradually spreads in the fodder stock. It is necessary to detect fodder rotting which should be immediately removed and fodder stocks should be treated by necessary preservants so that contamination of fodder is avoided. It is necessary that

contaminated fodder is not used at the level of consumer and cattle owners. They should be punished for using rotten fodder for cattle consumption.

These fodder cold storage godowns should be placed in Bundelkhand at convenient places so that fodder rescarves at such places are evenly distributed all in nearby areas. These units serve more or less as rescarve and their stocks can be managed according to demand and supply factor. The distribution can be in such a way so as to provide maximum facilities to its consumers. There should be testing teams who should be made responsible to check fodder stocks in these godowns and cold storage. The fodder containers should be selected out of the material which do not make fodder rot or ferment. Research facilities should be developed in Bundelkhand to guide fodder stocking. It may be necessary that fodder moisture should be taken away mechanically because dry fodder can be preserved for a much longer periodbefore it is finally consumed. Fodder is quickly fermented and large stocks are wasted every year. Fodder preservation needs active research work which should be able to provide simple and cheap methodology.

5. FODDER CROPS CULTIVATION BY STATE, INDIVIDUAL AND CO-OPERATIVE AGENCIES:

Fodder crop cultivation was completely neglected in the past and there was no organized system of fodder cultivation. Fodder production was mostly at the mercy of rural cattle owners who were indulging in various types of agricultural production. This was the reason that fodder was substituted by the different types of cattle feeding. Most common was grazing and the remaining food material required a specialized effort by cattle owners. Even the fermented fodder and other inferior stuffs harm the health of the cattle and this adds to the problem of cattle management. Fodder food production should be in conformity with the number of cattle in the region. It becomes the responsibility of both the individual as well as the State to undertake fodder production. The object is to make fodder readily available as it is not provided at subsistence level for cattle consumption. Initially fodder production should be developed at large scale and gradually has to be commercialized to provide food for millions of starving cattle. Even the cattle population has to be graded

to get the maximum benefit for the Society. We also have to learn to respect the cattle population and not allow the cattle to multiply indiscriminately in order to get maximum benefit. The cattle number has to be controlled without delay. It is in this reference that fodder production has to be undertaken on large scale in Bundelkhand. To make the fodder products not a waste, it has to be a joint venture by the individual and the State or its production has to be shared by both independently. It would be better if the fodder co-operative sectors are given the responsibility of fodder production. This will not only speed up production but also create interest in the village people. This will be a good incentive to people and they can undertake the whole process of fodder production and consumption by themselves. Society has to realize that they expect a lot from the cattle and at the same time they hardly take care of its health. Fodder production should have an organized sector and efficient management should be provided immediately in Bundelkhand to utilize the incentive sources available in the region for fodder production.

There should not be competition for fodder

production between individual, State and co-operative agencies. They should take the responsibility of fodder as a whole and utilize the maximum resources of the region for fodder production and its equal distribution to consumers. The State has to initiate fodder production actively by participating in fodder enterprises but later on the State can withdraw itself the responsibility of fodder production, distribution and management and pass it to co-operative sector and also to individual fodder producers. In this connection necessary financial involvement has to be developed and managed by the local people and financial help should also be granted by banks, insurance companies, different States and various other agencies. The technique of fodder production has to be a specialized one so as to minimize the inputs and relative outputs developed substantially. This has to be initiated in all the sectors of fodder production. The local talent in Bundelkhand should be properly initiated and utilized for making fodder trade economically beneficial to the local people and if such a confidence is created it will greatly help the cattle wealth of the region. In this

connection, necessary techniques should be provided on fodder fields and the Indian Grassland and Fodder Research Institutes should be able to provide techniques of fodder management to local people. The Institue should be able to give the sound knowledge in the shape of fodder farm demonstrations to be carried out on different basis of fodder production in rural areas. This part of the State can surely become a specialized one for the fodder development. The practical experience of Indian Grassland and Fodder Research Institute' is a boon to Bundelkhand for developing the fodder technology in the region. Ultimately this responsibility has to be shared by the owners and co-operative sectors for harnessing fodder resources and making this discipline effective and useful to the cattle wealth.

6. DEVELOPMENT OF STATE FODDER CORPORATION AND FODDER INSURANCE SCHEMES:

Bundelkhand region is very well suited for fodder production and it has become imperative to establish State Fodder Corporation along side with co-operative sector which would decentralize the process and maintenance of

fodder of the region. In this way fodder financing will be possible and will no longer be a disgusting enterprise. The risk of fodder development in Bundelkhand region can easily be covered by large scale fodder crop insurance schemes. The hazard of climate will no longer neglect or damage fodder production in the area. This will not only protect stocks but also create an element of confidence to cattle owners and develop fodder production in the area as a profitable enterprise. There are areas in Bundelkhand region specially in Jhansi which can be utilized specially for fodder production. State Fodder Corporation and fodder co-operative ventures shall surely develop an efficient production distribution agencies in the region. The whole project of fodder development should be made technically sound and its infrastructure should be properly maintained and developed. Fodder management should be such so as to provide guideline to this part of the region. Fodder preservation techniques should be properly developed and there should be different types of centres which should guide the local population for the proper maintenance of fodder stocks and they can also see that fermentation and fodder rotting

should not take place as it emits unnatural and harmful gases and fodder becomes poisonous to some extent for cattle consumption. Such corporation should be able to maintain testing laboratories at various centres in the region so as to provide help to local cattle owners. There should be regular give and take attitude between Indian Grassland and Fodder Research Institute of Jhansi and the State government and local cattle owners so as to obtain greatest benefit for fodder management. The purpose of fodder corporation is not to confine its activities to limited direction but its function should be broad based and useful to the cattle population of the region. It is suggested that in order to develop fodder technology in the region there should be working compromise between the State Fodder Corporation and local agenices and fodder management should be handled on scientific basis. The fodder insurance schemes should also be supplemented by financial help by different types of commercial banks of the region. The purpose to provide credit facilities at reasonable rate and to see that cattle does not suffer on account of paucity of funds. It should be made very clear that fodder

development in the region shall not in any way harm the normal production of rabi or kharif crops of the region because the area of fodder development can easily be separated as there is no derth of land in Bundelkhand.

The purpose of setting up State Fodder Corporation at Jhansi is also to obtain maximum State assistance in this direction. State involvement is necessary at every stage while fodder corporation will serve as an agency for providing fodder facilities at regional levels. Fodder insurance schemes can be worked out by active participation of cattle owners and cattle producers in this new venture.

7. <u>COMMERCIAL PRODUCTION OF FODDER MIXTURE AND FODDER CAKES AND COMPACT LIVE-STOCK FEED BY CO-OPERATIVE ORIENTED INDUSTRIES:</u>

Fodder utilization had not been according to the standard norms for providing nourishment to cattle. Generally it is found that fodder is in short supply or wasteful methods of providing fodder are prevalent in the region. In both the cases there is lot of mismanagement in relation to demand and supply. Fodder food should not be wasted at

all and a proper utilization method should be adopted without delay. Fermentation of fodder frequently takes place and it is essential that for the preservation of fodder food, necessary catalyst should be used. For its preservation sooner or later commercial production of fodder should be taken up and proper processing of fodder should be done before it is consumed.

Fodder commercial depots should be opened at several places in Bundelkhand for the purpose of scientific processing in order to provide guaranteed stuffs for the consumption of the cattle. The purpose of such commercial production will be to develop regulated fodder mixture for ready supply to cattle owners. Necessary preservants should be mixed in fodder mixture to avoid its decay and also to improve its taste. Fodder mixture cannot be made in advance because moisture after a certain period ferments the fodder. There should be some readymade automatic methods for preserving fodder food and fodder mixture can be made quickly at the time of delivery and it should also be consumed during specific period to avoid its decay. Fodder mixture should be kept in containers of different dimensions to be exchanged from time to time between

producers and purchasers. This will help the preservation of fodder food and avoid the possibilities of fodder contamination. Fodder mixtures are generally used for day to day consumption and so proper arrangement for its regular supply should be worked out from these commercial depots. It is essential that fodder mixture should be graded according to its weight and volume and its pricing should be done accordingly. In this way guaranteed fodder food through commercial fodder depots will be of great benefit for the cattle wealth of the region. Commercial fodder depots in the region should be a co-operative venture. This will not only give better incentive but also develop employment potential of the region. Fodder production, consumption and distribution with this type of enterprise will be a great boon to the region. Time has come when fodder will also be supplied in the form of readymade fodder cakes of measured quantity and standard quality. This type of compact food material for cattle consumption will be extremely useful during the movement of cattle from one place to another and cattle owners can keep fodder for their isolated and

long tiresome journey instead of taking bulk food. Fodder cakes can be kept for a longer period and it does not decay soon. Commercial fodder depots can be develop fodder mixture and compact fodder cakes simultaneously and in this way the cattle food will no longer be a problem. The co-operative sector can play a great role in commercial fodder production th ough its depots for the supply of fodder mixture and compact fodder cakes. In this way fodder production will no longer be a burden but it will give great incentive to fodder producers and consumers. Bundelkhand area can be divided out in accordance with fodder production and the proposed commercial fodder depots can be started under co-operative sector without delay. The infrastructure of this organization can easily be worked out as soon as fodder production is speeded up.

The animal husbandry department should be able to provide necessary staff in the region to guide and supervise fodder maintenance and the quality control of fodder mixture and the compact live-stock food and fodder

cakes in the commercial production depots of the region. It is necessary that fodder production and its maintenance in the area should be closely linked between the animal husbandry and agriculture departments. These departments should be actively concerned and made a responsible for quality control and provide guideline for fodder productivity in the region.

In this way they will be responsible in the development of efficient commercial fodder production in the region. It is also suggested that testing laboratories should be established and fodder mixture and cakes should be regularly tested before sale. The co-operative sector should be given exclusive facilities for running commercial depots in the production of fodder mixture and cakes, at the same time the management of sales and maintenance will be done under co-operative venture. Fodder development is to be treated as a co-operative oriented industry which should be nourished properly. This can be a subsidiary occupation of the people who either own cattle or land or both.

The compact live-stock feed should contain not only a part of fodder but also other cattle food gradients. so that the compact food mixture should be able to provide complete and measured food for the cattle. It should be able to provide one meal by each one unit of compact food. In this way it will become easier to give measured diet to the cattle to avoid waste. There should be no left over food and fodder cakes and compact live-stock feed, both should be able to provide food to young and fully grown up cattle according to their respective requirement. It is a wrong practice that whatever fodder food is left over by the cattle , is generally given to their young ones. This system is risky because there is strong possibility of spreading infections and also disease. The purpose of commercial production of fodder mixture is only to simplify the procurement of fodder food according to need and also to avoid waste. There are many cases where the cattle are over fed and there are no norms in providing meal according to its caloric value in accordance with the need of the cattle health. Certain chemicals can work as preservants

if they are mixed in fodder mixture or in any type of live-stock feed. These preservants are harmless and at times they also help in improving the taste of fodder food. It is necessary to include such improvement in such commercial food mixture in order to make cattle food more popular for the health of the cattle wealth. Bundelkhand area can provide all such facilities for commercial fodder production. It is also a strong possibility of developing fodder and other food jdices which can supplement the normal food. The bulk of fodder can well be replaced by fodder jàices and a time may come soon when such food mixture juices become more popular in the region. As such the bulk of fodder can easily be replaced by juices which are compact and easy to store.

8. HARNESSING VACANT LAND ALONGSIDE RIVE BANKS:

The land along the riverbanks contains good amount of moisture. This is an asset in Bundelkhand and mostly these areas are not well cared for and are neglected. It is necessary to make use of these riverbanks tracts for

the cultivation of fodder as the development of these areas will not in any way clash with agricultural development. Even areas around drains and nalas can be well utilized for fodder production. Such exclusive areas of fodder production can become nucleus for development of fodder based industries in the co-operative sector and making fodder as commercial crop. Even barren land can be harnessed from time to time. Fodder cultivation will also help in soil preservation in the area and the evil of soil erosion can be eliminated gradually. Bundelkhand region is gifted with green pastures and the green landscape is ideal for cattle grazing purposes. Its preservation will not be difficult and vacant areas can be developed into grazing grounds and can be protected and preserved with the help of local people and necessary fencing can be made by local talent and with the help of forest department. The Indian Grassland and Fodder Research Institute can do a lot in the development of pastures and cattle grazing ground and its preservation should be at the local and State level. In this way the

vacant land of Bundelkhand can be well utilized for the use of cattle not only in the form of fodder but other types of green grass. There should be a proper organization which should look after the grazing ground and supervise its development. There should be proper co-ordination between fodder production and in the development of green pastures for cattle grazing. It will be better if a joint type of fodder and grass grazing land management be developed in the region for harmonious functioning of various cattle feeds in a developing economy. The usefulness of cattle is nothing less than the importance of man and material and economic development. Both human and cattle resources contribute in increasing regional and national productivity.

River banks areas in Bundelkhand are somewhat unlevelled and landscaps are high and low due to soil erosion. The local drains when they join the rivers they make ravines by soil erosion. Unevent and culturable soil is not retained properly and washes away specially during the rainy season. This process has made the river banks

of Bundelkhand suitable for the purpose of cultivation. It is important that the river banks areas should be properly protected by stone pitching so as to avoid soil erosion. The ravines can be gradually levelled out in order to make use of river banks for cultivation purposes. Such areas can be brought under cultivation without much expenditure. Such areas are available because they contain more mosture as they are near the rivers and they can be brought under plough easily. Fodder cultivation can first be developed on these river banks which makes soil more fertile. It will be better if these neglected river banks tracks are controlled and brought under plough by different State and other agencies by harnessing land without delay. It will be much better if fodder cultivation is speeded up in these areas and proper planning is worked out at village and district level. If necessary, these surplus tracks are given only to provate cultivators so as to give more incentive and nothing as charged from them and they may be allowed to use land freely for a couple of years. At later stage the barren land can be utilised if it is used for

cultivation. River banks tracks can also be protected by afforestation methods. Tractor organization in the State can be deployed in the region to fill the ravines and other mechanical equipments can be obtained from army units and they can level out the ravines in no time as a part of their routine army exercises. This will not at all be expensive to administration. The government should take necessary steps and obtain help from army units without delay. Army exercises is a routine feature is Bundelkhand, specially in Jhansi and river banks areas are also within their reach and they can be of great help for harnessing river bank tracks for the purposes of fodder cultivation. This will be of a great incentive to local rural population and they can be easily mobilised also for undertaking river trac s for their own benefits. Rural participation is necessary because they form a working force of the region. The State administration is supposed to make out river bank area after survey and respective State department should be entrusted to develop the plan for harnessing river banks in these areas. This will not

only help to develop cultivation in these areas but also encourage fodder and agricultural development. The river banks areas are more useful for providing irrigation facilities. The sub-soil water should naturally be easy at higher level and it will not be difficult to obtain sufficient quantity of water in Bundelkhand. The local wells can be constructed by private and Stage agencies. If Minor Irrigation Department and Rural Engineering Department of U.P. can handle well construction along side river banks. Even co-operative societies and other types of agencies can undertake the construction of well in the region. These wells can also be utilized for drinking water purpose and rural water supply in the villages through Jal Nigam and Jal Sansthan. This multi purpose function of wells along the side of river banks in Bundelkhand will be a step to improve cultivation. In this way fodder cultivation can easily be concentrated in areas for commercial fodder cropping.

9. DEVELOPMENT OF PASTURES, FALLOW LANDS AND LANDSCAPE :

Most of the Indian cattle is accustumed of grazing themselves since time immemorial. Generally cattle search its own food in the vast fields of rural life. Even the cattle owners leave them and make them free for some time so that the cattle may search food for themselves and graze in the open field. There are no organized and well developed grazing ground and generally they grow themselves on account of moisture content in the soil. Cattle generally find green grass for themselves on open field and they also eat away leaves of nearby plants and as such they roam about by themselves without any reservations. In villages the cattle owners at times take their cattle for grazing on agricultural fields and it is noticed that cattle eat away not only the growing crops but also destroy the fauna and flora of the region. The reason behind these tragedies is that there is no provision for the organization and maintenance of grass fields for the cattle. These apathy of State government and indifference of private owners are responsible for these establishment of grazing

facilities for the cattle. The State government is not in a position to envolve in the establishment of grazing areas as it is difficult for them to utilize the abundant grazing resources for the cattle feed in relation to financial involvement. The cattle has no option but to manage its own food through reckless grazing. The cattle do great harm by grazing the open fields by adversely affecting the fertility of land. Whenever the cattle foot and mouth hit the ground in the course of grazing the fertility of land diminishes on account of its impact on the ground. A stage comes when the sprawling grass fields looses its normal grass growth on account of frequent grazing by animals and cattle. This evil can not be eliminated unless grass grazing is confined to certain fields alone.

The grazing fields should be earmarked separately and should be maintained properly in order to supply food for the cattle. The other areas of haphazard grazing should be prohibited by the State government.

Bundelkhand is also a victim of this evil and there

are no proper areas reserved for grazing purposes.

It has become now necessary to develop natural pastures fallow land in the areas of Bundelkhand. Bundelkhand is gifted by its all natural bounties where pastures on fallow land can be developed without incurring away expenditure. The landscape of this region is such that the abundant supply of natural environment can be well maintained and preserved for the health of the cattle. The pastures fallow land and landscapes if properly managed can be a great source for providing reserve supply of food for cattle feed. These areas can be available for grazing without loosing its natural charm and they can be a source of perennial supply of food material for cattle wealth Bundelkhand can take a lead in this direction. Such type of pasture fallow land can be controlled and developed in co-ordination with forest, agriculture and animal husbandry departments. It will not be difficult to develop pasture and fallow land in Bundelkhand. The areas surrounded by ponds, river banks and wells it will be possible to develop pastures and

fallow land where water moisture is available throughout the year and the landscape in very well suited for the purpose. It will be similar if the animal husbandry department develop cattle centre at nearby such spots so that cattle movement for grazing is controlled and managed according to need. The ill-health of the cattle in Bundelkhand is on account of vagories of climatic conditions So, it is necessary that green pastures and fallow land should be developed and abundant supply of barren land is well utilized for the purpose of cattle grazing without loosing their natural charm. It has now become necessary that there should be a well developed plan for the development of grazing ground which should be left open after grazing purposes. The other areas should be protected and grazing should be developed in these areas. The use of tree leaves for grazing purposes should be protected in Bundelkhand. The dry area of this region should have green trees and pastures. This neglected area should be utilized in proper way for the benefit not only for cattle but for local population. The grass and fodder research institute at Jhansi is a great help and its services be utilized for the development of grazing fields for the cattle.

GENERAL CONCLUSION:

It has been found that harnessing of fodder crops in Bundelkhand had been greatly neglected in the past. The cattle wealth of the region has to be nourished in order to retain the essential asset of the region. Its survival will greatly help in improving the cattle life of Bundelkhand. People of this region had been adopting the conventional method of maintaining cattle feed in the form of fodder. There happens to be no organized development of fodder and its growth had not been satisfactory in the past. The food problem is ~~of~~ two fold, viz.,

(1) Managing fodder food

(2) Cattle health

Bundelkhand region has not been able to produce fodder in sufficient quantities. The cattle food is usually supplemented in the form of cattle grazing and also by other type of food material for cattle health. This clearly indicates that there is no incentive in people for developing fodder crops.

Fodder food cannot be replaced by other types of food available for cattle consumption. Fodder food is generally for those cattle which are managed by their owners while astray cattle manage their own food and graze from place to place. As such it is essential that fodder production should be managed by cattle owners in such a way so that they do not depend on other types of food supply. Fodder crop may be classed as a major subsidiary crop along side with cash crops. It will be better if fodder production is also confined to specific regions according to suitability and convenience. There should be fixed target and time-bound fodder production so that fodder is available throughout the year and in sufficient quantities. In addition to this it is necessary that suitable conditions for the development of fodder crops should be properly created in Bundelkhand region.

Fodder production has to be given a commercial look so that fodder producers get economic benefits in fodder production also. The management of fodder production has also to be supplemented by providing different types of fodder feed in the form of fodder cakes and ready fodder

meals. Its preservation and maintenance is also to be streamlined. Fodder management has to be worked out in the same way as food for human consumption is managed. This requires complete coordination between the State and the people so that both share the responsibility for the benefit of cattle wealth of the region. In addition it is also necessary that proper grazing facilities are provided on large scale in the region. The areas in Bundelkhand are such which are very suitable for the development of grazing ground. Different varieties of grass can be developed in the region with the technical guidance of Grass and Fodder Research Institute along with the help of Agricultural Department of the State. There can be very many varieties of grass and fodder products which can feed the cattle throughout the year.

The other problem is the cattle health of the region. Cattle wealth has to be utilized as cattle power so that the region can get all the benefits of cattle wealth. Cattle provide dairy products of different varieties and also it is widely used in ploughing, bullock carts in rural areas, thereby linking rural life with

urban life. The hides and skins of cattle also have great commercial value which has to be harnessed. In addition cattle health is maintained with the help of Veternary Department which is responsible for looking after the cattle of the region. Bundelkhand has under nourished cattle which need good fodder food and planned future. Bundelkhand region also possesses favourable climatic conditions for the development of fodder crops with surplus land which can be exclusively used for fodder production. Fodder management is generally sub-standard which ultimately affects the cattle health. The fodder production has indirect profitability and so it cannot be compared with the direct profitability of cash crops. Fodder crops have to be ultimately segregated from other cash crops for its commercial survival. Bundelkhand region can take a leading role in developing fodder crop production as men, material and technology are locally available. With the development of fodder production, Bundelkhand region can take great strides in dairy farming and dairy products. Cattle wealth and fodder production are closely linked with dairy farming and the development of dairy products in the

region. The State Government along with local talent can develop dairy farming in public and co-operative sector. This will develop fodder production and ensure cattle health in the region.

Fodder production can never be uneconomic enterprise. It has to be commercialised in such a way so as to give reasonable livelihood for cattle owners and also ensure the health of their cattle. The State Government cannot show its apathy any longer but it should come forward with helping hand so as to create confidence in the region. Bundelkhand possesses under-fed and under-nourished cattle. Good pedegree animals are rare. The rural and urban owners of cattle have to be guided for proper maintenance of their cattle wealth. It will be a great day for Bundelkhand region if it takes lead in fodder production and provides fodder production technology to the rest of the State.

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